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ABSTRACT

Media for instruction can be characterized as big (expensive) or little (inexpensive), but research evidence suggests that whether a student learns more from one medium than another depends at least as much on how the medium is used as on what medium is used. Thus, this report discusses not only example programs and their results, but also considerations involved in choices among the different possible media. One conclusion which is reached, however, is that the inexpensive media have often been neglected because of the glamor of the expensive media. (RH)

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A Report to the Agency for International Development

by
Wilbur Schramm

Institute for Communication Research
Stanford University
March, 1973

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A Report to the Agency for International Development

by

Wilbur Schramm

With the advice and help of
his colleagues in the
Institute for Communication Research

Stanford University
March, 1973

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SUMMARY

SUMMARY

[Readers who prefer to see the evidence
before the conclusions may read this as
Chapter IX]

The first chapter in this book is an introduction to the topic. The next three chapters present what we might call the micro-evidence -- controlled experiments, general analyses of teaching and learning tasks and of costs, that bear upon the selection of media for instruction. From laboratory and theory, the book then moves to the field. Chapters V through VIII present macro-evidence. They review actual field projects, built around instructional media in four areas: national educational reform, extending the school, other formal uses of instructional media, and non-formal education. The objective is to analyze what this experience tells us about the effect and cost-effectiveness of different instructional media used for different purposes in different situations.

Obviously, not everything has been tested. Hard evidence from the field is in short supply. Cost-effectiveness studies are few. Studies of the least complex and least expensive media hardly exist; the more costly and glamorous media draw the lion's share of research

funds. In some respects these pages tell us more of what still needs to be learned about instructional media than what has been. But tentative guidelines do emerge, of interest and importance to developing countries and other governments and agencies concerned with the development of education.

Motivated students learn from any medium if it is competently used and adapted to their needs. Within its physical limits, any medium can perform any educational task. Whether a student learns more from one medium than from another is at least as likely to depend on how the medium is used as on what medium is used. These general conclusions we believe can be maintained.

This evidence does not challenge the assumption that one medium may be more effective than others in a given situation. It does indicate that there is no invariant advantage for Big Media or Little Media or any type of Big or Little Media, in all situations. The selection of the most desirable medium or media system, therefore, depends upon an analysis of the situation, and requires a complex rathe~ than a simple decision.

In Chapter I some attention is paid to the act of selecting an instructional medium. This choice is not necessarily always rational or made on the basis of assumed cost-effectiveness; for example, it may be possible at a given time to get support for a television project or a non-formal project or whatever else is in fashion, and not for others. But to the extent that the selection process is rational, it would seem to depend upon an analysis of the task, a judgment on the learning effectiveness of different media for that task, and an estimate of the probable cost of one medium versus others. These elements we call the Task Vector, the Learning Vector, and the Cost Vector, and take them up respectively in Chapters II, III, and IV.

Chapter II demonstrates that most theory about instructional tasks is specific to the task rather than to the media, and is a better guide to the instructional content of media than to the choice of media. The events necessary for instruction can in most cases be provided by any one of several media. The decision as to which one is most desirable, therefore, becomes a matter for professional judgment and availability. To a certain extent the judgment can rest upon such common sense questions as: does the task require a picture? does it require motion or a still picture? does it require sound? and so forth. But selection of a media system requires an averaging of such task requirements over the many kinds of tasks to be performed during the teaching of a curriculum, and this, in turn, introduces questions of cost and resources.

Chapter III presents a great deal of research evidence that students learn efficiently from any medium, Big or Little. There is reason to believe that the chief sources of variance in learning may be within rather than between the media; how one teaches may make more difference than the medium one uses. This does not imply that in a given case, as we have said, a student is not likely to learn more from one medium than from another, but the research gives us no very clear guidelines as to which combinations of media and subject matter work best. There is little doubt that if one can afford and has available a truly multi-media capability, one should be able to arrive at a media-mix more efficient than any single medium. But combinations of media are not always widely available in developing countries. In their absence, the number of different academic and non-academic courses and subjects, at different levels, in which different instructional media have been used and from which students seem to have learned efficiently, is reassuring.

Chapter IV shows that, as expected, Big Media cost more than Little Media, sometimes a great deal more. But this, too, is not an invariant guide to selection. Some media (e.g., television) may be prohibitively expensive for a small audience (except in special cases where CCTV is used to share large lecture courses in a university), but reasonable in cost for a very large audience. Some media (e.g., television, radio) are better adapted than others to carry the bulk of instruction in a course; others (e.g., films, filmstrips, audiotapes, transparencies, etc.) are better adapted than radio or television for special supplementary services when needed. Some media (e.g., radio, television) require central control over content and scheduling; others make possible a great deal of local control and allow a teacher to schedule them for the convenience of a class or a student to use when they are needed for individualized study. The situation must therefore be analyzed not only in terms of cost and available resources, but also in light of the goals and requirements of an educational system and, beyond these, the larger needs of a country.

So there are no simple and unqualified reasons for preferring Big or Little Media. It is hard to think of an instructional situation in which, so far as we can judge from the evidence, only one medium or combination of media could possibly be successful.

Chapter V then turns to actual situations in which the decision on media has had to be made and put to the test of practice. This chapter begins with four of the best known and most spectacular media projects in the world -- cases in which an attempt has been made to build nationwide educational reform around instructional media, and thus to bring about the reform much more quickly than could otherwise be accomplished. On these four projects we have extensive hard evidence from El Salvador (which began four years ago) and American Samoa (eight years ago), less hard evidence, as yet, from Niger (eight years), and only the beginning of evidence from the Ivory Coast (which is only in its second year). None of these projects has done everything it was intended to do in a way it was expected to, but nevertheless, each one has been able to make dramatic and far-reaching changes, in a short time, in one of the most change-resistant institutions of society, the formal school system.

Each of the projects chose to use television as its chief medium. It is impossible to say whether quick and broad educational reform, if it depends heavily upon instructional media, has to use television, for apparently no one has ever tried to bring about such a reform with the aid of radio or films or any other medium, large or small. (It would be interesting to see what radio could do, given a comparable assignment, in a developing country.) The people in these projects feel that reform would be harder to bring about without television, and harder to accomplish with a medium other than television. They argue that the very size and logistic demands of television require a commitment to change, and make other change easier; that television imposes a schedule on change; the dramatic quality of the medium dramatizes change; it catches the interest of pupils and demonstrates good teaching to classroom teachers; it makes it easier to get money from outside -- in other words, they credit television, quite apart from its own ability to teach, with serving as a catalyst of change. Yet, television is an expensive item in a project of this kind, and represents an add-on cost unless it enables teachers to handle more students or saves money on related services like teacher training or non-formal education. Chapter V suggests certain conclusions on how television can be used most efficiently as an agent of system change.

Chapter VI analyzes a number of the projects which have used instructional media to help extend learning opportunities where there are no schools. There is a wide variety of these, from Australia's radio-correspondence school for children who live in the remote "outback" of that continent, through Mexico's Telesecundaria which offers a secondary school by television to towns that have no such school, to the multi-media British Open University. Some of these schools offer academic credit (like the three just mentioned), others do not. Some are in developing countries, others in highly advanced countries. The cost-effectiveness data, where they exist on these projects, are almost universally encouraging. Students learn, on the average, at least as well from one of the school extension programs as students in the same curriculum in traditional classrooms. The extension education usually costs less than classroom education, and very considerably less than it would cost to offer the same opportunities in the same places by building, staffing, and operating traditional schools.

Each of the school-extension projects has drawn upon either radio or television, or both, as a primary medium for carrying live teaching to its students. So far as the evidence on learning tells us, there seems surprisingly little to choose between television and radio, although there is considerable difference in cost. One of the more interesting trends in this type of project is the tendency of such systems to grow toward multi-media use. None of the programs has found it satisfactory to use only radio or television; all of them have felt the need to provide other media and also some two-way communication with a teacher, whether by correspondence study, school days, study groups, two-way radio, tutors, or, more often, a combination of these. Thus, although this pattern of instruction places more responsibility on the student to manage his own learning and enables him to study wherever he is, still it tends to develop in such a way as to provide a maximum of interchange and a variety of learning opportunities.

Chapter VII considers some of the less spectacular but more common uses of instructional media -- for enrichment, for supplement, for core teaching without institutional change in mind, and so forth. It would be a very long chapter except that most of the learning data in Chapter III and the cost data in Chapter IV come from projects of these same kinds, and leave little doubt that almost any medium can be used effectively for such contributions to teaching and learning. The real question is which medium provides a better fit to the situation. For example, to teach a million students with the same programs, as in Thailand, or 400,000 with the same programs, as in Colombia, obviously called for a wide-coverage medium. Those two countries used radio and television, respectively. On the other hand, for ordinary enrichment of teaching, there may be good reason to use a medium that can be controlled and scheduled by the teacher (like films, filmstrips, audiotapes, etc.) especially if it is inexpensive enough that local materials can be used to localize the examples.

Chapter VII tries to supplement the data in Chapter III and IV by examining some studies from continents other than North America and Europe, whence come most of the experimental results. It takes up some studies on Thai radio and on Colombian and Indian television, a Japanese study of television in a mountain village, an almost unnoticed achievement of programmed instruction in Central Africa, and others. It also reanalyzes economic data from Colombia and presents new economic data from Thailand.

Chapter VIII is on the use of media in non-formal education. Pointing out that the concept of non-formal education is not sharply bounded, it reviews a spectrum of projects in the field, from efforts to "localize the school" in Tanzania and Chad, which use a minimum of any kind of media, to several different ways of using groups in combination with media, to the use of media in development campaigns which typically use as many different channels as are available. Among the types of groups examined are the deciding group (such as the radio rural forums of India, Togo, and elsewhere), the study group (for which Radio Sutatenza is used as an example), and the discussing group (as seen most commonly in Niger, Senegal, and other countries of French Africa, and usually built around the role of the *animateur*). Cost and effectiveness figures for these projects are reviewed where available.

As television seemed to be the medium for national educational reform, radio and television (tending toward multi-media) the natural avenues of school-extension, and all media suitable to the other types of formal education, so there is a temptation to say that radio is the medium of non-formal education. However, it would be more nearly accurate to say that the non-formal media are the Little Media. Having said that, one must admit that television also can and does contribute to non-formal education. The more local the project, the less need of instructional media at all, and the less argument for using Big Media. The bigger, the more costly the media, the more difficult it is to localize a project. Radio may be the best compromise between a local curriculum focusing on local needs, and the sharing of expert teaching and expert information over large areas at low cost.

Two implications emerge from the analyses of projects, cases, and experiments in this volume. In the first place, it must be asked whether much of the research on media comparison -- which at best is difficult to do realistically, and at worst is meaningless -- might not profitably be redirected toward studies of effective ways to teach with the media and effective ways to fit them to a given situation. These are the more practical problems, rather than trying to find a general rule that television is more effective than radio, or radio is more cost-effective than television, or something of that sort. In the process of redirecting this emphasis in research, both the concepts of cost and effectiveness might well be broadened to take in social costs and social consequences, and cognitive changes beyond the ability to respond to questions on an achievement test.

In the second place, have the Little Media not been too much neglected both by researchers and by planners? Why is there so little research on instructional radio or the less expensive visuals? Why are governments in developing countries encouraged, by their own planners and by outside donors, to go into television when they are really at a stage to support radio? As is said in Chapter I, the concept of "oxcart to airplane," overleaping the intermediate steps, needs to be re-examined.

A visitor from another small planet, unfamiliar with the atmosphere in which educational development projects come into being, would be astonished to see how much of the effort and resources of a typical project go into procuring expensive hardware and operating it rather than into producing more effective software for less expensive hardware. We are not denying that the Big Media are important tools of instruction, that television, optimally used, may be an unequalled teaching tool, or that Big and expensive media like CAI are likely to bulk larger on the horizon of education during the next two decades. What we are saying is that all of us may be guilty of giving too little thought to what the Little Media can do for learners.

If one were to pick out three types of smaller instructional media that could be recommended in good conscience for more attention at this moment by developing countries and indeed all countries that feel themselves in need of rethinking, non-formalizing, individualizing, extending their educational systems, then one might think first of radio (and its offshoot in audio recordings), secondly of filmstrips and loops, and thirdly of programmed instruction.

I

THE PROBLEM

In his book The Conditions of Learning, Robert Gagné stated three propositions concerning instructional media which provide a useful starting point for this review of research on media. He wrote:

> First, no single medium is likely to have properties that make it best for all purposes. When effectiveness of one medium is compared with another for instruction in any given subject, it is rare for significant differences to be found. Lectures have been compared with reading, lectures with motion pictures, pictures with text, and many other kinds of comparison have been made without revealing clear superiority for any given medium. At any given time, a medium may enjoy unusual popularity, as has been the case, for example, with television, teaching machines, and computerized instruction, at one period or another. Sometimes one medium is found by research to have an advantage for one subject matter only to be shown to have none for another subject matter. Over a period of years, researchers have learned to be skeptical of single instances of reported statistical superiority of one medium versus another.
>
> Most instructional functions can be performed by most media. The oral presentation of a teacher can be used to gain and control attention, but so also can the use of paragraph headings in a textbook, or an animated sequence in an instructional motion picture. The learner can be informed of the expected outcomes of instruction by a printed text, by an oral communication, or in some instances by a picture or diagram. Recall of prerequisite learned capabilities can be done by oral communication, by means of a sentence or picture in a text, or by a movie or television pictorial sequence. Similar remarks could be made about every one of the functions of instruction. . . . It is possible, of course, that additional research of an analytic nature may yet reveal some important special properties of single media that make them peculiarly adapted to one

> instructional function or another. Up to now, however, the most reasonable generalization is that all media are capable of performing these functions.
>
> In general, media have not been found to be differentially effective for different people. It is an old idea that some people may be "visual-minded," and therefore learn more readily from visual presentations, while others may be "auditory-minded," and therefore learn more readily from auditory presentations. While a number of studies have been conducted with the aim of matching media to human ability differences, it is difficult to find any investigations from which one can draw unequivocal conclusions. . . . If this idea has validity, it has not yet been demonstrated. A possible exception is this: several studies have shown that pictorial presentations may be more effective than printed texts for those who have reading difficulties or small vocabularies. This is hardly a surprising result, and it seems wise to refrain from overgeneralizing its significance.
>
> (Gagné, 1965, 363-364)

We have begun with this passage from Gagné's notable book in order to demonstrate that one of the beliefs about instructional media most commonly held by teachers, broadcasters, and laymen has not gone without challenge from scholars. We refer to the belief that Big (usually audiovisual and costlier) Media teach more than Little Media (which are usually single channel and less inexpensive than their bigger brothers).

This belief is extremely important because it has long had an effect on the choice of media for instruction. And this, in turn, is important because every state and territory in the world now depends to some extent on instructional media to make it possible, as Sir Eric Ashby expressed it and as Comenius said three hundred years earlier, for "the teacher to teach less and the learner to learn more."

The developing countries, especially, count upon the media to raise the quality of instruction faster than it could be done by making changes in the teacher corps, to supplement even good teaching by adding learning experiences impossible to create in individual classrooms, and to extend the reach of education to areas where schools and teachers are not otherwise available. In these less developed countries, the choice of instructional media represents a decision to invest scarce resources. The richer countries can afford to make an occasional mistake in their investments in education; the less developed ones, many of them already spending 25 per cent or more of their annual budget on education, can hardly afford such a mistake.

For the developing countries, therefore, the choice between Big and Little Media is especially important. By Big Media we mean the more complex and costly devices of instruction such as instructional television, films, and computer-assisted instruction. These require not only sophisticated and expensive hardware, but also highly skilled and trained personnel for both hardware and software responsibilities. By Little Media we mean the less costly, less complex ones like radio, tape recorders, filmstrips, slides, transparencies, visuals of all kinds. We do not suggest that the classroom teacher and the printed text or workbook are not instructional media, in the broad sense of the term, or that the cost of teachers' salaries is not the chief item in a school budget. Rather, we are saying that these two "media" are so well established and generally accepted that the decision over whether to have teachers and texts is no longer a troublesome one to most school systems -- although how much to invest in expanding or retraining the teacher corps is often a difficult question, and how to improve the printed text is one of the most under-studied research questions in education. But the really troublesome questions are in the area of what to add to these two basic channels of instruction.

The glamour additions are the Big Media. Many less developed countries, following the lead of the industrialized nations, have hastened toward adopting television, despite its great demands in cost and skill. Films, despite extremely high unit costs, continue to be the preferred supplementary medium, as television has become the preferred medium of core instruction. In the wings is perhaps the most expensive and one of the most promising of all the Big Media, computer-assisted instruction, which is still in an experimental stage even in the highly industrialized countries. The shape of the decision before policy planners and educators in developing countries is therefore whether to invest in a Big Medium like television or a Little Medium like radio, a Big Medium like films or a Little Medium like filmstrips; among either the Big Media or the Little, which medium or media; and, indeed, whether it is justifiable in a given situation to put money into any new medium rather than into the improvement of teachers and/or texts.

The decision is likely to be a complex one. Furthermore, in actual practice it may not be entirely a rational or a free decision.

We know very little, even anecdotally, about the way instructional media are actually selected. Such accounts as are available suggest that the decision may often be impulsive rather than judicial; and that, especially when a nation enters upon the massive use of instructional media, the motivation may as often be political as educational. Often the decision is influenced by the interest of an outside country which is willing to provide money. For example, all four national decisions by developing countries to use instructional television massively to achieve educational reform were undoubtedly affected by the willingness of donor countries or international organizations to help. In Samoa, it was the U.S. Department of the Interior contributing funds and personnel to one of the national territories. In Niger, it was massive funds and personnel contributions from the French government. In El Salvador, it was help from U.S.A.I.D., UNESCO, and other donors. In the Ivory Coast, it was chiefly the French government and the International Bank for Reconstruction.

Furthermore, once a decision has been made to introduce an instructional medium, particularly a Big Medium, that decision tends to control all later ones. For example, when a government has made a large investment in television, it is difficult, if not politically impossible, to go any other educational road. So much is committed that one cannot afford to admit failure. The hardware is available; it is far easier to make more use of it than to change.

We are not implying that such an investment is necessarily a mistake, or that a Big Media project is necessarily a failure, or that changes should necessarily be made. We are saying merely that the decision to select media for instruction often may be less than free and rational, and that it may often be based on considerations other than the amount of learning to be achieved or on a judicial comparison of alternatives.

Nevertheless, we are going to assume that there remains a large element of rationality in decisions to choose among instructional media, and that there is some use to try to sum up such evidence as exists to illuminate that decision.

Ideally, we should like to believe that the choice between and among Big and Little Media is some resultant of three decision vectors, which we might call the Task Vector, the Media Vector, and the Cost Vector. By the Task Vector we mean analysis of the educational goal and the instructional events which must occur in order to achieve it. By the Media Vector we mean analysis of the capability of different media or combinations of media to do what needs doing in the expected situation where it must be done. By the Cost Vector we mean the estimated cost in financial, human, and technical resources of using a given combination medium or combination of media, measured against the resources available and against competing needs. For example, if trained teachers are in short supply, the time and cost of training them must be weighed against the possibility of substituting another medium and using less-well trained teachers. If no technical infrastructure exists, the effort of supplying power and providing maintenance for the more sophisticated media must be considered, along with the advantage of making this contribution to the country's technological development. And the probable contribution of the necessary investment to overall national goals and objectives must be estimated against the probable contribution of other investments in other sectors. It is evidence in relation to problems of these kinds that we are going to try to assemble.

The following pages, therefore, will be less useful, say, to a country like Sweden, in which all the media are in good supply and the schools are accustomed to analyze their instructional tasks and use whatever combinations of direct and mediated teaching are called for by a given lesson, than in a developing country where the choices are still open, the resources are scantier, and the choice between Big and Little Media is of major importance to the planning of the educational system.

The concept of "leap-frogging" over simple technologies to sophisticated ones needs to be examined. This idea grew out of a thoroughly well-intended desire to help the new countries speed their development. Why should these countries have to follow the long painful path of the older countries from agricultural society? Why could they not jump directly from the oxcart to the airplane, from the town crier to television? Why can they not make full use of the experience of Japan and the West, instead of learning by their own trials and errors? This seemed like a reasonable point of view, and it led to the industrialized countries offering their most advanced informational technologies to the new countries. As Carpenter says, "there is a strong tendency for highly industrialized countries like the United States or West Germany to try to accomplish, in developing countries and with overly complex equipment, what they have not succeeded in doing at home. Spain is advised to go all-out for computer-assisted instruction and micro-videotape teacher training before radio or simpler, more adaptive sound slide, sound tape, and motion picture technologies have been explored. Satellite relays of educational television programs are recommended for India by advanced industrial countries before All-India Radio and very feasible expansions of audio radio facilities have been committed and applied for educational purposes. The pressures and goals for industrial growth and foreign markets, and perhaps as well, the frustrations of fully applying proved but less glamorous technologies in education often lead to 'leap frogging' over the proved and practical to high-risk adventure with the latest great complex technological system" (Carpenter, in Schramm, ed., 1972).

On the other hand, as Carpenter readily admits, the cheap and the small may not always be the best and most efficient. Under-scaling may be as inefficient as over-scaling. This, too, is an especially important matter for the less developed countries because they cannot afford not to take advantage of appropriate help from new technology. They have the same delicate problem in determining scale of size and complexity with instructional technology as in all other technology that relates to their national growth.

This report has been written with the needs and concerns of the developing countries, rather than those of the highly industrialized ones, chiefly in view.

It may be helpful to say something about the nature of the evidence available to assist the developing countries in such decisions. In broad terms, there is micro-evidence and macro-evidence. The micro-evidence consists of propositions derived largely from theories of learning and instruction, and of experiments and evaluations which, at their best, are controlled with laboratory precision and directed at specific and limited hypotheses intended to contribute to theory. The macro-evidence consists mostly of studies of entire projects in a realistic situation, conducted with the intention of examining, so far as possible, the total decision and its total effects.

These kinds of evidence are considerably different. For one thing, the micro-evidence comes almost entirely from the highly developed countries, and the great bulk of it from the United States. The macro-evidence that seems most relevant comes in large part from the developing countries. The micro-studies, if they are experimental, are usually done in a laboratory or a laboratory situation and are concerned with the effect of a certain kind of treatment on a certain kind of learning by a certain kind of learner in a certain kind of situation. These studies must be interpreted in terms of other kinds of learners and other situations, and often projected to other treatments and other kinds of learning, in order to be really useful for practical decision-making. On the other hand, the macro-studies are less well controlled than the best of the micro-studies, but include more decision elements and reproduce a situation which is realistic to a planner in the developing regions of the world. These macro-studies have the practical strengths and weaknesses of a case study as compared to a laboratory experiment, although they often include experimental evidence.

Ideally, we should like to find in the research and theoretical literature the same precise kind of guidance that is available on the engineering side of communication: to launch a satellite of w weight requires a rocket with t thrust. . . given a transmitter of p power, we can expect to deliver a signal of s field strength at m miles, and so forth. That is, we should like to be able to say that to teach mathematics in the third grade to a given number of students, television is a better investment than radio or programmed instruction or something else. That kind of guidance does not exist in any reliable form. Rather, the research evidence requires us to consider the situation and conditions of learning, and even then gives us relatively little specific guidance. As Smith and Smith said in their study of cybernetic learning, no audio-visual device or medium of non-verbal communication "has relatively invariant properties as an aid to verbal learning which can be studied and assessed independently of the operational situation" (Smith and Smith, 1966).

Therefore, the act of selecting a medium or media of instruction is not like looking in an engineering handbook for a field strength formula, or in a road atlas for the most direct route. To the extent that selection is a rational act, the decision-maker is likely to have to consider a skein of complex information. His search for that information will lead him within the media to the message, for there is good reason to think that the nature of the instruction carried by the medium is responsible for moreof the variance in learning than is the medium itself. It will lead him to consider carefully the needs and abilities of the students he wants to teach. It will lead him into considerations that are peripheral to the amount of learning, though crucial to a planning decision -- costs; availability of personal, technical, financial resources; and the relation of the proposed investment to the needs and resources of the country or the system. And, if the medium or combination has been used in a realistic situation in a developing country for a given purpose, he will certainly want to ascertain and weigh that experience.

For a given situation, one medium or combination of media is likely to be more desirable than another, for one reason or another. That -- rather than straightforward advice to use television, use radio, use CAI, use something else, or use nothing -- is as much guidance as we can expect from the literature at this time.

In the following chapters we are going to move from the theoretical evidence into the experimental and thence to the field studies. In none of these areas is the evidence as complete and as useful as we should desire. But certain guidelines emerge, and these we shall try to identify.

II

ARE THERE BIG MEDIA TASKS AND LITTLE MEDIA TASKS?

The theoretical literature on task analysis tends to be task-specific rather than media-specific. The question for this chapter is whether any framework of principle and rule, beyond professional judgment and logistical considerations, can be found in the literature to relate a given kind of instructional task to a given medium, Big or Little.

Nature of the evidence

In recent years the attention of learning theorists has turned increasingly from the basic kinds of learning identifiable in studies of animals to the more complex kinds observed in human beings. In 1931, Thorndike expressed the opinion that all learning was basically the same, but nevertheless distinguished the Pavlovian conditioned response from the trial and error learning by which a child learns to say "mama" or a dog learns to "shake hands." Skinner (1938) and Hull (1943) distinguished "chaining" from more basic kinds of learning. Tolman (1949) and Woodworth (1958) identified five and six kinds of learning, respectively. Gagné (1965) presented an eight-fold classification of human learning, and Razran (1971) in his evolutionary typology of learning distinguished 11 kinds.

Let us then begin with a classification of the kinds of learning that are assumed to occur during instruction, and to which instructional media might be expected to make a contribution.

There are many types of such classifications. Perhaps the best-known is Bloom's (1956), which is essentially a taxonomy of the cognitive outcomes of education in terms of knowledge, comprehension, application, analysis, synthesis, and evaluation, and therefore is more useful in evaluating the goals of a curriculum or a course than in designing the specifics of instruction. The same may be said of Krathwohl's taxonomy of affective outcomes (Bloom, Krathwohl, et. al., 1965), which appears to be the only major attempt to classify the affective domain and, rather surprisingly in view of the importance of the attitudes and values supposed to be taught by the educational system, has had very little use. We have placed both Bloom's and Krathwohl's taxonomies in the Appendix, along with some other related material, including a recent taxonomy of the psychomotor domain, by Fleishman (1972). But there are also other varieties of typologies. For example, developmental psychologists like Piaget (1967) and Erikson (1963) have classified the stages in the development of a child's personality and intellect. Personality psychologists and psychoanalysts have classified learning outcomes in their own ways. Thus, Maslow (1962) deals with categories like "self-actualization," Kelley (1962) with "a fully-functioning self," and Hollister and Bower (1966) with such types as "differentiation vs. confusion." These are not of obvious assistance in matching media to instruction.

It is not surprising that the most useful bridges between theory and practice should be built by the so-called "training psychologists." These are scholars who, mostly, have studied under one or more of the great laboratory learning theorists like Thorndike, Hull, Guthrie, Tolman, or Skinner, and then have worked for a time in the training programs of the military services or of industry, where they have had a chance to apply the principles of experimental psychology in a situation where it was necessary to produce practical results. These are men like Melton, Lumsdaine, Hawkridge, Glaser, Stolurow, Briggs, and Gagné, most of whom have now moved to university professorship where they contribute importantly to the scholarly literature but remain on the growing edge of the developing field of instructional technology.

Of all these, perhaps it is Gagné's The Conditions of Learning (1965) that represents the best bridge between learning theory and the technology of instruction, and Gagné's cooperation with Briggs and others in Instructional Media (1966) and other publications of the American Institutes for Research that best point out the road between instructional technology and media selection. Since we are looking for road maps, we shall begin with Gagné.

Classifying the types of learning

Gagné's taxonomy of learning, in his own words, appears in Table 1.

TABLE 1

Gagné's Taxonomy of Types of Learning

Type 1: *Signal Learning.* The individual learns to make a general, diffuse response to a signal. This is the classical conditioned response of Pavlov (1927).

Type 2: *Stimulus-Response Learning.* The learner acquires a precise response to a discriminated stimulus. What is learned is a connection (Thorndike, 1898), or a discriminated operant (Skinner, 1938), sometimes called an instrumental response (Kimble, 1961).

Type 3: *Chaining.* What is acquired is a chain of two or more stimulus-response connections. The conditions for such learning have been described by Skinner (1938) and others, notably Gilbert (1962).

Type 4: *Verbal Association.* Verbal association is the learning of chains that are verbal. Basically, the conditions resemble those for other (motor) chains. However, the presence of language in the human being makes this a special type because internal links may be selected from the individual's previously learned repertoire of language (see Underwood, 1964b).

Type 5: *Discrimination Learning.* The individual learns to make *n* different identifying responses to as many different stimuli, which may resemble each other in physical appearance to a greater or lesser degree. Although the learning of each stimulus-response connection is a simple Type 2 occurrence, the connections tend to interfere with each other's retention (Postman, 1961).

Type 6: *Concept Learning.* The learner acquires a capability of making a common response to a class of stimuli that may differ from each other widely in physical appearance. He is able to make a response that identifies an entire class of objects or events (see Kendler, 1964). Other concepts are acquired *by definition*, and consequently have the formal characteristics of rules.

Type 7: *Rule learning.* In simplest terms, a rule is a chain of two or more concepts. It functions to control behavior in the manner suggested by a verbalized rule of the form, "If A, then B," where A and B are previously learned concepts. However, it must be carefully distinguished from the mere verbal sequence, "If A, then B," which, of course, may also be learned as Type 4.

Type 8: *Problem Solving.* Problem solving is a kind of learning that requires the internal events usually called thinking. Two or more previously acquired rules are somehow combined to produce a new capability that can be shown to depend on a "higher-order" rule.

(From Gagné, 1965, pp. 63-64)

It will be useful to say a few words about each of these kinds of learning, and some of their implications for instruction.

Signal learning does not ordinarily play a very large part in the design, say, of a public school curriculum. It is the kind of learning that takes place when a child learns that a reproving shout by a parent is likely to signal punishment. Guthrie (1935, p. 48) gave a delightful example of signal learning in a passage which Gagné also chose to quote:

> Two small country boys who lived before the day of the rural use of motor cars had their Friday afternoons made dreary by the regular visit of their pastor, whose horse they were supposed to unharness, groom, feed, and water, and then harness again on the departure. Their gloom was lightened finally by a course of action which one of them conceived. They took to spending the afternoon of the visit retraining the horse. One of them stood behind the horse with a hay-fork and periodically shouted "Whoa," and followed this with a sharp jab of the fork. Unfortunately, no exact records of this experiment were preserved save that the boys were quite satisfied with the results.

The anecdote illustrates very clearly how signal-learning is brought about.

Stimulus-response learning is something that plays a large part in all educational experience, formal and informal. Whereas the outcome of signal learning is a relatively involuntary and emotional response, the outcome of S→R learning, as Gagné very properly points out, is a precise and controlled action. E.g., the child learns to say "mama" on demand, and the dog learns to "shake hands" as that has been demonstrated to him. The conditions for this kind of learning are (1) the stimulus ("say 'mama'" or "shake hands"), (2) some guidance in the response, and (3) some reward or reinforcement when the response is made. Whereas the horse probably responded without any guidance when he was stuck with the hay-fork, the dog is not likely to shake hands until he is shown how to do it and until his progressive improvements in the act are rewarded. This encouragement of an ever-nearer response to the intended outcome is what Skinner calls "shaping". It is what happens when we listen to a foreign language practice tape, and repeat what we hear until our pronunciation more and more resembles that of the native speaker on the tape.

Chaining is a type of learning that can take place only when several stimulus-response connections have already been learned. Every parent has seen his child come to the wonderful day when he begins to use words in a new instrumental fashion. He has learned that his mother brings to him warmth and security and food, and he has learned to say the word "mama." One day he suddenly puts all this together and calls for the person who brings him these rewards. In other words, he has made a chain. We learn complicated motor chains when we learn to tie a knot. The conditions for such learning are (1) the previous learning of the individual links in the chain, and (2) the occurrence of these events close together. The second step in the knot sequence must follow closely upon the first one, and so forth, until the knot itself appears.

Verbal association is the kind of learning that goes on when one learns the foreign equivalent of an English word. The conditions for this kind of learning are (1) the prior learning of an English word with its meaning, and (2) the ability to say the foreign word, and, (3) in addition, the presence of some "coding connection" that enables the learner to associate the foreign word with the English one. Studies of nonsense syllables (for example, Jenkins, 1963) have demonstrated that even paired associates can be most easily learned by finding a mediating term by which to connect them. Gagné gives the example of learning the French word alumette, meaning match in English. Before this can occur, the learner must already associate the word match with the object match, and he must be able to say the French word alumette. If he can say it well enough to note the syllable lum then he may have a built-in coding connection: lum may make him think of the word illuminate, or vice versa. And thus he builds an associative chain: match calls up the picture of a burning match which illuminates the surrounding space; illuminate calls up the syllable lum; and this ties in the word alumette, which now is associated not only with the word match but also the image of the burning match.

Discrimination learning is the kind of learning that goes on when one learns which of his keys fits the office door and which one fits the front door at home; or when a child learns to distinguish a triangle from a square; or a boy learns to tell the annual crop of new automobiles by name. Obviously it is a very important kind of learning. The conditions for accomplishing it are (1) prior learning of the chains that are to be discriminated (for example, we know the appearance and the name of a triangle, or a Buick), and then (2) sufficient practice in distinguishing one from the other to get rid of the "interference" that occurs in trying to remember a number of things that are only slightly different. In other words, the individual chains must be learned so well that the differences among them will be obvious.

Concept learning is learning to classify stimuli. We have to learn to recognize the concept of "peopleness" in order to distinguish people in general from animals or trees in general, and the concept of "hotness" in order to classify certain stimuli as hot rather than cold or wet or expensive. This is the way we learn to organize our worlds, and to free ourselves from always having to deal with single particular stimuli. We generalize upon individual occurrences, relate them to each other, and store them away for easier retrieval. Thus, the learning of concepts is one of the major keys to handling the complexity around us. What are the conditions for learning concepts? (1) Sufficent number of discriminations must have been learned to make it possible to recognize and respond to the particular attribute that is to be conceptualized; and (2) the learner must be exposed to a variety of stimuli incorporating this attribute, so that he learns to discriminate the attribute rather than merely the stimuli themselves. This will ordinarily require practice with a number of different situations all including the attribute that is to be conceptualized.

The amount of practice can be reduced, and the learning of concepts can be greatly speeded, if an individual has learned enough language to take a verbal shortcut. For example, he can learn the concept of "middle" by simply being told that it means "in between" -- if he understands "in between."

Learning rules is learning a relation between concepts. For example, one learns that "round things roll," "spring follows winter," or "the square of the hypotenuse of a right triangle equals the sum of the squares of the other two sides." To learn a rule, it is necessary (1) to learn the concepts involved --e.g., the idea of roundness, and rolling, and things. Then (2) one can be presented a verbal chain that relates the concepts, and if the chain is not too complicated it is easily learned. The actual practice of learning rules usually involves demonstration and often the kind of investigation by the learner that some scholars call "discovery." To learn to state the rule is not always to "understand" it fully. But the importance of learning rules is that they make it possible to comprehend and often predict dynamic and hierarchical relationships in the world around one. They let us think in terms of "if....then...." Needless to say, much of the learning that goes on in school is the learning of rules of one kind or another.

Problem solving is the use of learned rules to create new ones. It is the essence of "thinking something out." Thus, it may be very complex or very simple. A person solves a problem when he calculates how many hours he will have for work if he arises at a certain time.

Then he is in position to make his new rule: If I want to do so much work, I must get up at such-and-such a time. That, of course, is an everyday pattern of thinking things out. A student sitting in school calculating how long it would take to go to Mars, given a certain rocket, is solving a more academic kind of problem. Einstein, combining sophisticated rules of mathematical physics into rules that became known as the Theory of Relativity, was following the same process.

What is this process? One must (1) have some idea of what kind of solution he is looking for; otherwise, he will waste effort. Then (2) he must recall the rules that are relevant to the problem. Finally, (3) he must combine those rules so that a new rule -- which may either be the solution or a step toward the solution -- emerges. Gagné and others are quick to admit that we know relatively little about the act of combining rules to make a new one, which is to say that we know little about the act of thinking through problems so that the solution emerges, usually in a "flash of insight." But this is a high order of thinking and perhaps the highest order of learning.

Analyzing hierarchies

It can easily be seen that Gagné's taxonomy is hierarchical in nature. Thus:

Learning

Stimulus-Response Connections (2)*

is prerequisite to learning

Chains (3) and

Verbal Associations (4)

which are in turn prerequisite to learning

Discriminations (5)

which must precede the learning of

Concepts (6)

which are prerequisite to the learning of

Rules (7)

which are required for

Problem Solving (8)

Most learning is hierarchical. One step must be taken before another can be successfully accomplished, and all the simpler types of learning are subsumed under the more complex forms. Instruction is designed that way. As an example, see Figure 1, which outlines a process for learning a basic reading skill -- the ability to pronounce printed words.

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*Mowrer (1960) suggests that stimulus-response connections probably require signal learning (1) as a pre-requisite. Gagné is unwilling to draw this conclusion without further evidence (1965, p. 66).

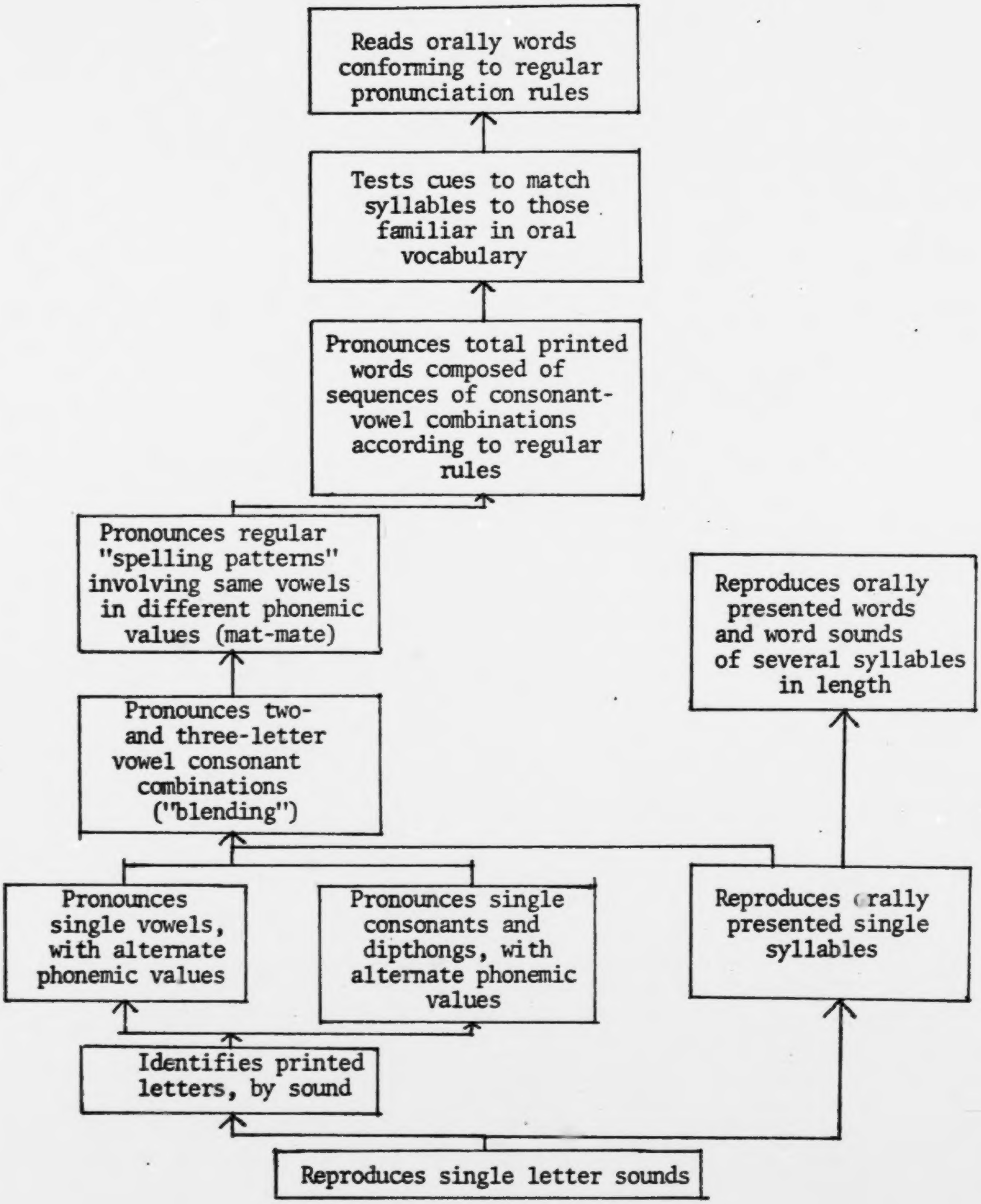
Reads orally words conforming to regular pronunciation rules
Tests cues to match syllables to those familiar in oral vocabulary
Pronounces total printed words composed of sequences of consonant-vowel combinations according to regular rules
Pronounces regular "spelling patterns" involving same vowels in different phonemic values (mat-mate)
Reproduces orally presented words and word sounds of several syllables in length
Pronounces two- and three-letter vowel consonant combinations ("blending")
Pronounces single vowels, with alternate phonemic values
Pronounces single consonants and dipthongs, with alternate phonemic values
Reproduces orally presented single syllables
Identifies printed letters, by sound
Reproduces single letter sounds

Figure 1. A learning hierarchy for the skill of "decoding" printed words so as to be able to read them aloud (after Gagné, 1965, Figure 20, p. 271).

Note that this begins with a relatively simple skill, the ability to reproduce the sounds of single letters. As a matter of fact, it begins wherever the learner is. If he cannot discriminate letters and sounds (for example, the f from the s sound, printed p from printed b), those skills must be mastered first. Then he can move step by step. He can relate these sounds to the appropriate letters. Soon after that he must learn the hard news that English letters have more than one sound (as, for example, i and c have). Then he moves gradually to pronounce groups of letters and finally to reading whole words.

But note the right side of the chart: if the learner is already able to pronounce the sounds of printed syllables, he can skip over some of the activity represented by the left side of the chart. If he can already pronounce the sounds of groups of syllables, then he can skip further practice of that skill and go directly to the more advanced practice of reading aloud.

Thus, the design of instruction requires one to ask where the student is on a hierarchy of learned skills leading up to the objective of the lesson or the course. Incidentally, it presents a problem for media, except individualized media, because the media material must strike some balance between losing the students who are not ready for it and boring the students who are already beyond it.

Analyzing events of instruction

So far, we have not learned any code that shows us how to fit a given medium to a given learning task. We have worked down from the goals of instruction through the types of learning involved to the idea of learning hierarchies. Now let us come to the question of what actually happens in instruction. What can a teacher do, either with an instructional medium or face-to-face teaching to bring about the necessary learning and help his students up the ladder toward the desired objective? In other words, what are the events of instruction?

These are what actually appear on the television screen or constitute the teacher's classroom behavior when trying to teach to a given objective. Gagné has listed types of instructional events as follows:

1. Gaining and controlling attention. An external stimulus arouses the appropriate attentional set.

2. Informing the learner of expected outcomes. Communication, usually verbal, tells the learner about the kind of performance he will be able to do after he has learned.

3. Stimulating recall of relevant prerequisite capabilities. The learner is reminded of the relevant intellectual skills, and also verbal knowledge, that he has previously learned.

4. Presenting the stimuli inherent to the learning task. The particular stimuli to which the newly learned performance will be directed are displayed.

5. Offering guidance for learning. Usually by verbal

> communications, the learner's thinking is directed by prompts or hints until the essential performance is achieved.
>
> 6. Providing feedback. The learner is informed of the correctness of his newly attained performance.
>
> 7. Appraising performance. Opportunity is provided for the learner to verify his achievement in one or more situations.
>
> 8. Making provisions for transferability. Additional examples are used to establish increased generalizability of the newly acquired behavior.
>
> 9. Insuring retention. Provisions are also made for practice and use of the new capability so that it will be remembered.
>
> (Gagné, 1965, p. 304)*

It will be noted that this list is sequenced in the order of probable presentation. Event number one would ordinarily precede event number two, and so forth. Most treatments of instructional technology make much of the importance of sequencing the events of learning in an optimum way. For instance, here is what Schalock (1970) has suggested as an optimum sequence for teaching a principle:

---

*Bretz (1971, p. v) has presented a list of "uses of communication for instruction" which are essentially events of instruction and which he says make distinct requirements of communication, equipment, and content. This is his list:

1. Providing the learner with knowledge of his learning objectives
2. Motivating the learner
3. Presenting information
4. Stimulating discussion
5. Directing learner activities
6. Conducting drill and practice
7. Reinforcing learning
8. Providing a learner/simulator interface
9. Evaluating learner progress and program effectiveness
10. Assisting in the administration of instructional programs.

There are literally dozens of such lists, most of which resemble either this one or Gagné's.

> After getting the learner's attention, the teacher (or the film or the textbook or whatever channel of instruction is being used) will:
>
> 1. Inform the learner what he is going to learn to do -- that is, what performance will be expected of him when the learning is completed.
>
> 2. Question or otherwise stimulate the learner in a way that requires the reinstatement (recall) of the previously learned concepts that make up the principle.
>
> 3. Present cues - verbal statements, pictures, guidance - that will lead the learner to put the principle together, as a chain of concepts, in the proper order.
>
> 4. By means of questions or other cues, ask the learner to demonstrate one or more concrete instances of the principle.
>
> A fifth step is optional but useful for later learning. The learner may be required, by a suitable question, to state the principle verbally.
>
> (Schalock, 1970, II-4: 20)

A thing to note about this sequence is how much activity it requires of the student. This is no special problem to a classroom teacher, or to makers of programmed instruction or CAI. It is of considerable concern, however, to programmers of television, radio, or film, who must constantly think about how to encourage learning activity in their students, and to users of a multi-media system, who must consider what channels to combine in what order to encourage optimum activity.

Fitting media to tasks

What we need at this point is an algorithm for translating instructional events into media choice, as we have already translated learning tasks into hierarchies and events. This is where the theoretical literature begins to break down.

Perhaps the most direct attempt by instructional technologists to face this problem was made by Briggs, Gagné, and May in Briggs, et. al. (1966). They suggested six steps:

1. State the behavioral objectives* for the course or unit of instruction in the sequence in which they should be taught.
2. For each objective, identify the types of learning involved.

---

*"Behavioral objectives" is an important idea in instructional technology which it seems unnecessary to discuss in detail here. The idea grew with the growth of programmed instruction in the 1950's, and was stated perhaps most conveniently in Mager's programmed book, Preparing Behavioral Objectives for Programmed Instruction (1962). Essentially, the idea is that objectives can most usefully be stated in terms of the behavior that proves they have been achieved. For example, not that a student should "know" something, but that he be able to "recite" or "write" or "apply" it.

> 3. Using the required conditions of learning as a guide, design a "media program" for each objective which lists the instructional events, identifies the characteristics of required stimuli, and states the media options which would be acceptable.
>
> 4. Prepare a summary of the media options for a group of objectives making up a sequence of instruction, and scan these to identify frequently occurring media options.
>
> 5. Assign the media in which the instruction should be packaged to achieve the best trade-off in respect to effective stimulus display, convenience in changing from medium to medium, and economy in terms of size of unit in which each sequence is to be prepared in the given media.
>
> 6. Write specifications for the preparation of the instruction for the various media producers.
>
> (Briggs, et. al., 1966, pp. 28-29)

A little later in their book Briggs, Gagné, and May add some detail:

> Determining appropriateness of media...is a complex decision which cannot be done in cookbook fashion. For example, if the introductory portion of a course in science requires the learning of a number of concepts...the need for pictures (or actual objects) may be frequent. In such a case, an instructional sequence emphasizing pictures might be an efficient way to present this part of the course. In practice,

> a sequence of slides or a film might be designed, and might be the medium of choice provided it could include the other modes of presentation required (accompanying oral and printed speech).
>
> At the other end of the spectrum, there will be portions of a course which need pictures to only a limited degree. For example, if the student already knows the required concepts, a presentation of the principles...is simply not going to be helped by many pictures, if any....
>
> When a series of analyses of objectives indicates need for a mixture of diagrams, still pictures, verbal descriptions, and decisions to be made by the student, a format like programmed instruction would be appropriate.
>
> If movements of objects in space and time relationships are involved, as in understanding what causes night and day, a motion picture showing rotation of the earth and its revolution around the sun, accompanied by sound narration of the principles involved, would be relevant.
>
> (Briggs, et. al., op. cit., p. 34)

Thus, the selection of media is to be based chiefly on the way the different media can present physically the required stimuli for learning. This is the advice that Bretz gives in his little handbook for Rand and the U. S. Air Force -- The Selection of Appropriate Communication Media for Instruction: A Guide for Designers (1971). His approach can be illustrated by the diagrams in Figures 2 and 3, which show typical decision points in the process of selecting media.

The importance of professional judgment

There are two things to note about the impressively cohesive design we have extracted from the literature on task analysis: for one thing, how much it depends on professional judgment rather than

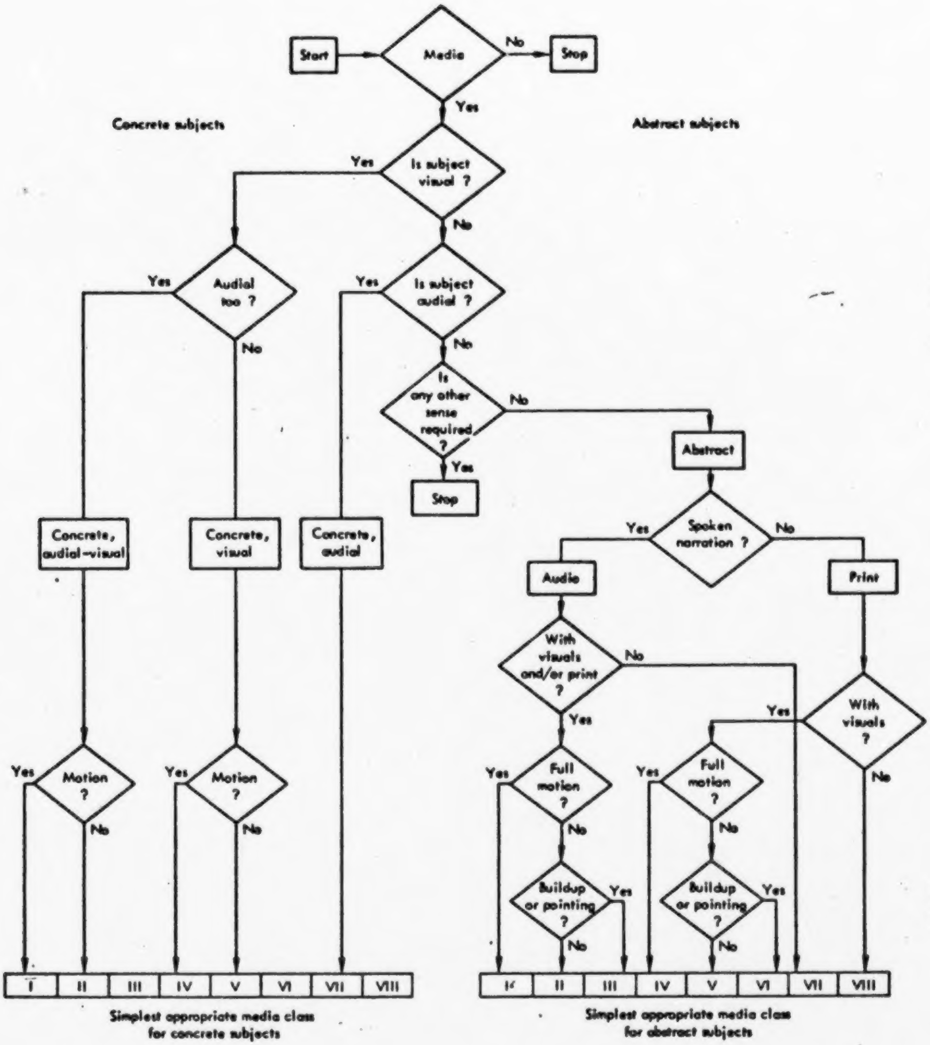
Start
Media
No
Stop
Yes
Concrete subjects
Abstract subjects
Yes
Is subject visual ?
No
Yes
Audial too ?
No
Yes
Is subject audial ?
No
Is any other sense required ?
No
Yes
Stop
Abstract
Concrete, audial-visual
Concrete, visual
Concrete, audial
Yes
Spoken narration ?
No
Audio
Print
With visuals and/or print ?
No
Yes
With visuals ?
Yes
No
Yes
Motion ?
No
Yes
Motion ?
No
Yes
Full motion ?
No
Yes
Full motion ?
No
Buildup or pointing ?
Yes
No
Buildup or pointing ?
Yes
No
I
II
III
IV
V
VI
VII
VIII
Simplest appropriate media class for concrete subjects
I
II
III
IV
V
VI
VII
VIII
Simplest appropriate media class for abstract subjects

Figure 2. Bretz's outline of the necessary decision points in selecting appropriate media for a given instructional need (Bretz, 1971, p. 30).

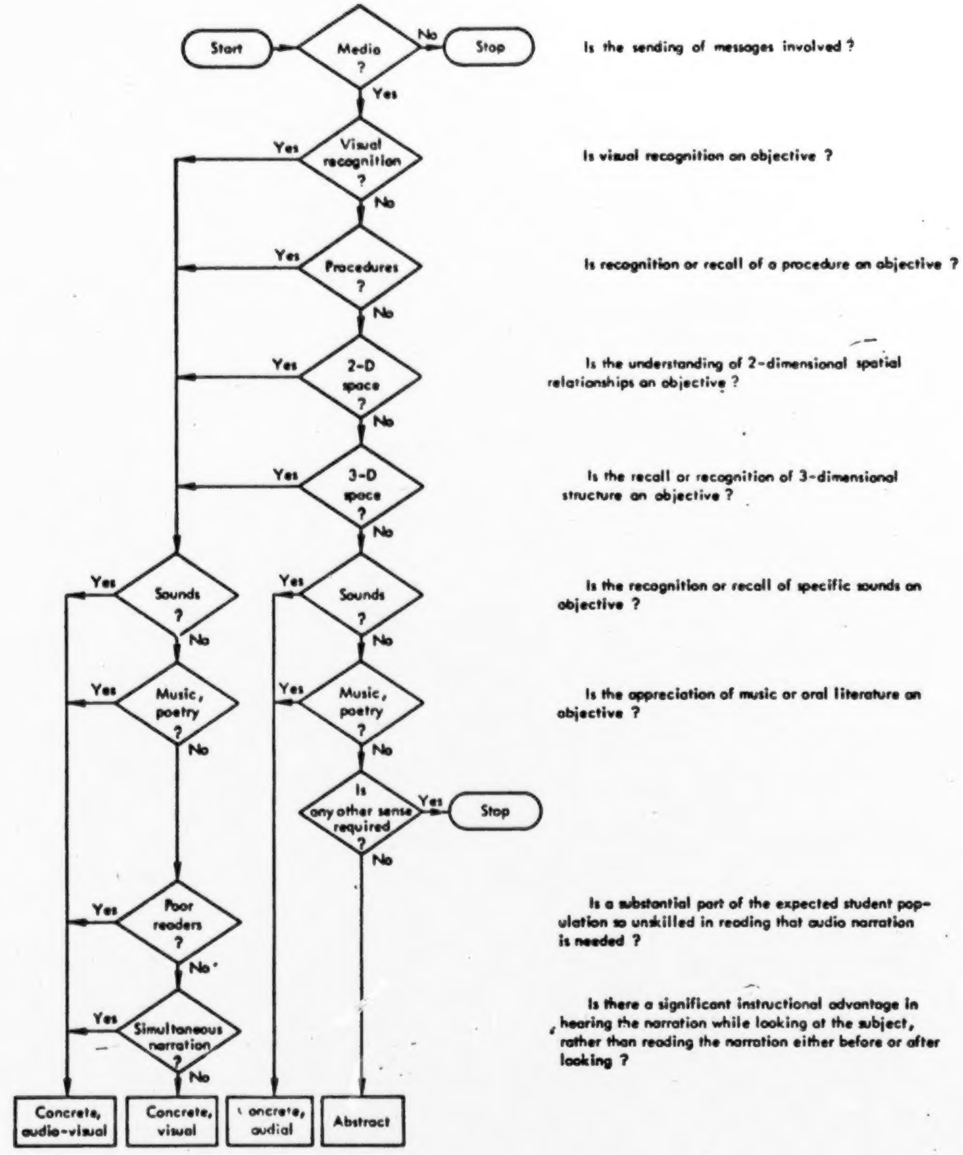
Start
Media ?
No
Stop
Is the sending of messages involved ?
Yes
Visual recognition ?
Yes
No
Is visual recognition an objective ?
Procedures ?
Yes
No
Is recognition or recall of a procedure an objective ?
2-D space ?
Yes
No
Is the understanding of 2-dimensional spatial relationships an objective ?
3-D space ?
Yes
No
Is the recall or recognition of 3-dimensional structure an objective ?
Sounds ?
Yes
No
Sounds ?
Yes
No
Is the recognition or recall of specific sounds an objective ?
Music, poetry ?
Yes
No
Music, poetry ?
Yes
No
Is the appreciation of music or oral literature an objective ?
Is any other sense required ?
Yes
Stop
No
Poor readers ?
Yes
No
Is a substantial part of the expected student population so unskilled in reading that audio narration is needed ?
Simultaneous narration ?
Yes
No
Is there a significant instructional advantage in hearing the narration while looking at the subject, rather than reading the narration either before or after looking ?
Concrete, audio-visual
Concrete, visual
oncrete, audial
Abstract

Figure 3. Bretz's elaboration of the decision points for distinguishing between concrete and abstract subject matter, specified in Figure 2 (Bretz, 1971, p. 32).

something more objective, and, secondly, how much more readily useful it is in selecting media for a small unit of instruction like a lesson or a course unit than in deciding whether to invest in a new media-system.

There have been very few attempts to systematize the expected usefulness of different media in relationship to different learning tasks. One of these is by Allen (1967), which is presented in Figure 4.

Allen's professional judgment has a special authority because he not only has done a great deal of research on instructional media, but also has written several competent reviews of research in the field and until recently was editor of the Audio-Visual Communication Review. Yet, there is very little specific research evidence behind these judgments, and some of them are likely to be questioned -- for example, the judgment that still pictures are "low" in their ability to develop attitudes, opinions, and motivations. Yet any of us can recall the overwhelming and instructive effect of a few still photographs -- like the picture of a little girl alone and crying in the middle of a bombed-out building, and more recently the impact of a photograph of a U.S. soldier setting fire to a Vietnamese thatched hut with his cigarette lighter.

Furthermore, only 17 of the 54 combinations in Allen's matrix are rated "low," with eight of those in the psychomotor area, and only eight combinations are rated "high," leading to the conclusion that most school tasks can be performed by a number of different media,

INSTRUCTIONAL MEDIA TYPE	Learning Factual Information	Learning Visual Identifications	Learning Principles, Concepts and Rules	Learning Procedures	Performing Skilled Perceptual-Motor Acts	Developing Desirable Attitudes, Opinions & Motivations
Still Pictures	Medium	HIGH	Medium	Medium	low	low
Motion Pictures	Medium	HIGH	HIGH	HIGH	Medium	Medium
Television	Medium	Medium	HIGH	Medium	low	Medium
3-D Objects	low	HIGH	low	low	low	low
Audio Recordings	Medium	low	low	Medium	low	Medium
Programmed Instruction	Medium	Medium	Medium	HIGH	low	Medium
Demonstration	low	Medium	low	HIGH	Medium	Medium
Printed Textbooks	Medium	low	Medium	Medium	low	Medium
Oral Presentation	Medium	low	Medium	Medium	low	Medium

Figure 4. Allen's chart of instructional media in relationship to learning objectives (Allen, 1967).

and in most cases quite satisfactorily by a number of media. In fact, the conclusion of many researchers is that the chief variance in instructional media effect is within rather than between media -- that is, how the media are used rather than what media are used makes the difference.

Two levels of decision

Another implication of the evidence we have seen on task analysis is that it is much more useful for one level of media selection than for another.

We are dealing in this report with two levels of decision. One is represented by the teacher or the course-planner deciding what medium or media to use during a teaching hour or a course unit. The other is represented by a planner in a developing country deciding what medium or media to introduce into his system. The teacher will ordinarily have all the media available he is likely to consider using, and therefore will not be making a major financial decision, although it may cost something to obtain transparencies or tapes or rent films or filmstrips and a considerable amount if he decides to buy computer time. The educational planner, on the other hand, is making a decision about adding something new, and this may require a very large financial commitment.

The first of these levels is the point at which learning tasks must be closely analyzed, and media chosen to fit them. Consequently, although all three vectors will enter into the decision on either level, the teacher or course planner will be interested in the kind of information we have placed in Chapters 2 and 3. At the second level, on the other hand, close analysis of learning tasks is not likely to occur. The educational planner must, of course, consider what kind of learning is going to take place. If he is going to introduce some new media to teach mechanical skills he may decide that the most useful thing he can do with media is to present a model which learners can imitate, and if that is the case he may find the visual or audiovisual media, and perhaps media that show motion, especially interesting. But he is obligated to deal with an estimate of the average efficiency of a given medium over many difficult tasks, and therefore to rely upon the assumption that people learn from any medium, that within limits any medium can be used for any kind of instruction, and that there is no best medium for all learning tasks anyway. Then he is likely to give his main attention to other considerations -- the cost, the availability of human and technical resources, the area to be served, how much control of the media must be in the classroom, and so forth. He will therefore find Chapter IV -- Cost -- most useful, and the Media Chapter (III) secondarily. And he may well find that the macro-evidence, which we shall present later in Chapters V and following -- the record of how these media have actually been used in the field, and what problems have been encountered and what results obtained -- of greater interest than any of the micro-evidence.

The central question

We must conclude, however regretfully, that task analysis as it now exists provides very little generalized basis for choosing between Big and Little Media -- at least at the level of selecting media systems. That decision is likely to be made on the basis of other considerations. Whereas task analysis is of the greatest interest to a teacher choosing media for a course or a lesson, of greater interest to the administrator deciding whether to invest in a new media system is situation analysis. He must be concerned with costs vs. resources, with technical requirements vs. abilities, with the degree of centralized control vs. local control required by his educational system and his educational plans, by the relative importance of adding individualized learning or common learning, by the size of the audience he wants to serve, and by the larger aspects of the task he has set for himself -- whether to serve the classroom or people out of school, academic students or vocational retraining, and so forth. He will be interested in the administrative and organizational problems different new media systems might bring. He will be interested in the record of practical experience in large projects with the media he is considering -- matters like these rather than close analysis of learning tasks. About these matters, too, we shall try to say something in the following chapters.

III

DO STUDENTS LEARN MORE FROM BIG MEDIA THAN FROM LITTLE MEDIA?

If we were to find evidence that people consistently learn more from Big Media than from Little Media, or the opposite, or even that for a certain order of tasks people consistently learn more from one size medium than the other, that would greatly simplify the problem of selecting instructional media. Therefore, in this chapter we shall look at the research evidence on learning from instructional media.

Nature of the evidence

There are well over 500 experimental studies of instructional media in the research literature. The greatest number of studies deal with instructional television, the next largest number with film, a considerable number with programmed instruction and computer-assisted instruction, relatively few with radio, very few with the simplest media such as filmstrips or audiotape, and almost none with textbooks. Most typically these studies compare learning from media with learning from conventional teaching without media; only a small proportion compare one medium with another. And unfortunately, a high proportion of all the studies are not entirely satisfactory in terms of scientific design.

When such studies are done in the field, the experimenter typically does not have enough control over the situation to be able to assign subjects randomly from the same population, or to reassign and shift teachers, or to avoid contamination of randomly selected groups when one group is taught by open broadcast, the other not. But even under the best of conditions, a media comparison study presents special problems for the experimenter.

Realism tends to conflict with science. Consider an example. Say that television is being compared with conventional classroom teaching. Experimental and control groups can be randomly assigned and then further tested for similarities; the same teacher can be used for both groups, or teachers can change places at intervals during the course; and if the experimenter has control of this kind, he may be able to achieve a quite orthodox experimental design. But nagging doubts remain about the control of the treatments.

Suppose the same teacher is used for both media (say, television) and face-to-face groups; will his teaching be identical in the two situations? If it is, we might doubt that he is making best use either of the classroom or the television. Experimenters sometimes try to equate the treatments by using a studio class as the control group and televising the teaching to students in another classroom, who form the experimental group. This insures that both groups will have the same teacher and the same teaching. But do they? Does the studio group, surrounded by cameras, lights, microphones, and technicians , really represent typical classroom teaching? The teacher must decide how much he teaches to the class in front of him, how much to the television camera. If he teaches to the studio class, he is likely to do the things a good teacher would do in a classroom situation -- ask or answer questions, respond to individual questions or cues, perhaps encourage discussion. This is unlikely to be the best teaching for the television class. On the other hand, if he teaches to the camera, he is probably cheating the studio class out of some of the advantages they might expect from face-to-face instruction. One solution to this problem is to have the teacher give an uninterrupted lecture, as he might do in a very large face-to-face class. But to compare a lecture on television with a lecture face-to-face is to use only a small part of the capabilities of either type of teaching.

Or take the problem of equating the treatments when two media, say radio and television, are being compared. Here the commonest solution used by experimenters is to let the sound track of the television represent radio; one group both sees and hears the program while the other group hears the audio part of the program. It is obvious that what is put on the television sound track is not very likely to be what a skillful radio broadcaster would put on radio. Such a comparison, despite its scientific quality, is of limited practical usefulness. A more realistic solution would be to assemble two teams from among the most capable radio and television producers and performers, give them common subject matter, restrict them in expenditures and time, and then encourage them to do the best job they can with their media. In fact, this is about what was done in the

Westley and Barrow experiment (1969) which we shall discuss a little later. But this solution has certain drawbacks in experimental design.

Thus, we cannot expect from these experiments as clear and conclusive evidence as their number would seem to promise. And instead of being able to depend on an abundance of direct comparative evidence, we shall have to enter the problem indirectly, by asking, for example, whether there is evidence that students learn efficiently from Little as well as from Big Media. That is the question we shall examine first.

Do students learn efficiently from any medium?

Because of the mass of evidence, we are going to present most of this material telescoped into a series of tables. Let us begin with the research on instructional television, which is more abundant and has had more critical attention than other parts of the research.

Television

Most of these studies compare television instruction with classroom instruction. And the finding is clear: the more carefully that such comparisons are designed and controlled, the more likely they are to show no significant difference in learning from the two sources.

In 1963, in the course of earning an Ed.D. at Penn. State, D. W. Stickell reviewed 250 experimental comparisons of this kind for the scientific acceptability of their design (see Stickell, 1963). He found only ten studies that he was willing to call fully interpretable, meaning that they met every requirement of a rather demanding standard. All ten had been done at Penn State in the 1950's. These are listed, with some details and with a brief indication of the standard of excellence they were required to meet, in Table 2.

Perhaps to soften this rather harsh commentary on non-Penn State research, Stickell identified 23 other studies which he called "partly interpretable," meaning that they had some flaw in their design but not a sufficient one to take away their usefulness completely. In a number of instances the flaw was related to the assignment of experimental subjects. For example, in some cases the subjects were matched in pairs before assignment, or they may have been permitted to volunteer before random assignment rather than being selected from an entire population. These 23 studies are listed and described in the Appendix to this report.

Of all these 33 studies, which Stickell felt constituted the cream of the experimental comparisons, only three showed any statistically significant difference. None of the "interpretable ten" showed any such difference. Three of the "partly interpretable" studies resulted in a significant difference in favor of the television group.

Of the 217 studies Stickell discarded from his original 250 -- the 217 that did not meet his requirements -- only 59 showed a difference between experimental and control groups, about evenly divided between results favoring television and results favoring classroom teaching (Stickell, 1963, p. 65).

TABLE 2

Stickell's 10 "Interpretable" Studies of ITV

All these had (1) experimental and control groups of at least 25, (2) which had been randomly assigned from the same population, (3) were taught by the same instructor, either by two instructors exchanging classes in the middle of the term or by seating one group in the room from which the class was being televised to the other group, (4) measured by a testing instrument judged to be reliable and valid, (5) which was evaluated by acceptable statistical procedures.

Experimenter(s)	Course	Subjects Exp.	Subjects Con.	Testing Instrument	Statistics	Result
Carpenter and Greenhill (1955)	Psychology college	152	75	Local test	F covariance	NSD
same	same	90	40	Local	F	NSD
Carpenter and Greenhill (1958)	Chemistry college	145	131	Local	F covariance	NSD
same	same	153	159	Local	F covariance	NSD
same	Business Law, college	45	42	Local	F	NSD
same	Sociology college	132	138	Local	F	NSD
same	Meteorology college	49	54	Local	t test	NSD
same	Psychology college	97	42	Local	F covariance	NSD
same	Music Appreciation, college	45	29	Local (listening)	t test	NSD
same	same	45	29	Local (knowledge)	t test	NSD

This finding is in agreement with the tabulation of Chu and Schramm of 421 television-classroom comparative studies (1967, pp. 7 ff.), of which 308 showed no significant difference, 63 came out in favor of television, 50 in favor of classroom teaching. Dubin and Hedley (1969) examined 381 such studies, including many of those in the Chu-Schramm list, and found 191 showing no difference, 102 in favor of television, 89 in favor of classroom instruction. Not all these differences were statistically significant. Where possible, Dubin and Hedley computed standardized scores from reported data and combined them. Working with 192 comparisons, they found ITV without talkback significantly superior to ITV with talkback and insignificantly different from conventional instruction, so far as learning was concerned. The studies in neither of these two reports just mentioned were subjected to the close examination given by Stickell.

However, the conclusion from this evidence must necessarily be that we have no basis in the research for saying that students learn more or less from television than from classroom teaching.

Not all the ITV experiments are comparisons with conventional teaching. Some use other measures of learning: standardized tests, criterion-reference tests, and so forth. A few of these experiments are listed in Table 3, which demonstrates clearly that students do, or at least can, learn efficiently when taught by television. Findings from the Educational Testing Service study of Sesame Street are shown in Figure 5.

TABLE 3

Examples of Learning from Instructional Television

Author	Study	Results
Ball and Bogatz (1970)	Measure of learning from Sesame Street by large sample of young children in four U.S. geographical areas.	The more that children watched the program, the more they learned of what it was intended to teach: letters, numbers, forms, sorting, classification, etc.
Alstead and Graf (1960)	Study of 10th grade students taught geometry solely by television, and 4th and 6th grade students taught reading by television with access to a talkback when needed.	85 per cent of 10th graders passed the New York Regents Examination, 30 per cent with scores over 90. This record compares favorably with classroom students. The 4th and 6th graders gained an average of 10 months on a standardized test in 9 months of study.
Castle (1963)	Study of physicians and medical students viewing an evening extension course on diabetes mellitus, given by television.	Physicians gained over 25 per cent, pre to post course; students, about 33 per cent.
Herminghaus (1957)	High school students taught for a semester by television in English and general science.	Average gain on two standardized tests of language skills was 25 per cent; on two standardized tests of science, 60 per cent.
Peerson (1961)	173 Alabama adults, both blacks and whites, viewed a TV course in adult literacy, in supervised groups.	Average gain in 33 weeks was between one and one-half grades, as measured by a standardized test.
Corle (1967)	32 teachers assigned randomly to two types of groups, one of which viewed a televised course on teaching mathematics, the other did not.	Experimental groups made highly significant gains on standardized test of mathematics, and showed significantly greater gains than controls on 2 of 8 measures of teaching performance; other six measures, n.s.d.

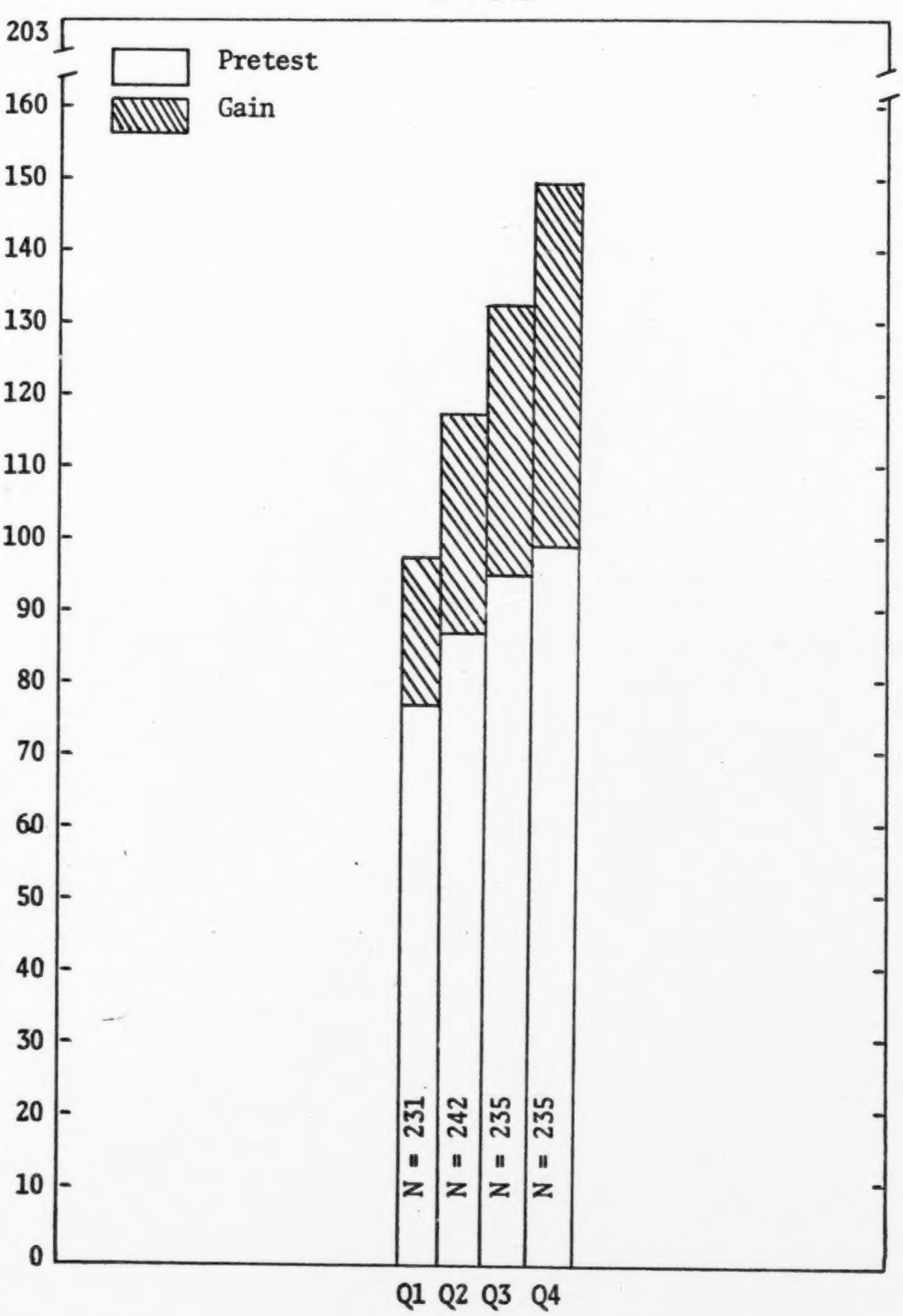

Figure 5. Learning from Sesame Street. Pretest and total test score for all children (by viewing quartiles).

(From Ball and Bogatz, 1970)

Film

It is generally assumed by educational technologists that what can be said about learning from film is much the same as can be said about television. As a matter of fact, many of the experiments on instructional "television" have actually used a film for projection through the television system. Experimental comparisons of film with direct teaching have about the same results as television-classroom experiments. And it is generally agreed that the differences between television and film relate chiefly to the different ways of delivering the two media, the fact that television can be presented live, if desired, and the greater amount of control that a teacher has over the use of a film if the film reaches her classroom.

Rather than making a full review of instructional film research, therefore, we have illustrated in Table 4 some experiments that note the amount of learning from films. Here, also, the evidence leaves us no reason to doubt that students can learn efficiently from instructional films.

CAI and Programmed Instruction

What is the evidence on computer-assisted instruction, which we must call a Big Medium, and programmed instruction, which is a relatively Little Medium? CAI, especially, still in the experimental stage and in the hands of university developers, has had rather careful research. Programmed instruction is made in such a way, by careful statement of objectives and repeated pretesting and revision, as practically to insure learning. And Tables 4 and 5 demonstrate that the results are as expected. Students learn from both media. The ability of CAI, in particular, to provide interactive drill and to save time over direct teaching has proved noteworthy. One study worth special attention is the Suppes and Morningstar report of teaching Russian language by computer. Seventy-eight per cent of the CAI students, only 32 per cent of classroom students, finished the year, indicating some advantage for students being able to practice on their own time and with a carefully designed and interactive routine. Figure 6 reproduces another finding of this same study -- that CAI students were likely to make fewer errors than classroom students, regardless of rank on the examination.

CAI and programmed instruction are really methods of instruction using, respectively, the computer and print as media of transmission. This method can be efficiently applied to other media also. For example, Gropper and Lumsdaine (1961) have effectively "programmed" a televised lesson. One of the more spectacular results of making instructional material by the methods of programmed instruction was reported by Markle (1967), who was able by empirical pretesting and revision to reduce the time for completion of a course in first aid by 25 per cent, and to increase the final test score from 145 for a traditionally taught group to 270 for a group taught by his new materials. Furthermore, he was able to reduce the standard deviation for the

TABLE 4

Examples of Learning from Instructional Films

Author	Study	Results
Ash and Carlson (1961)	Military subjects assigned randomly to groups, one of which saw films on military topics, the other did not.	Exposure to the training films doubled the learning of experimental group as compared to controls.
Hovland, Lumsdaine, Sheffield (1949)	Very large samples of military subjects tested on learning from three films designed to implant attitudes and information about World War II.	Experimental groups averaged about 50 per cent higher, on post-tests, than controls who had not seen the films.
Neu (1951)	Very large sample of army recruits separated into experimental and control groups, the former being shown a training film.	Mean learning scores of experimental groups between one and two standardized deviations higher than controls.
Wise (1932)	Motion pictures used as a supplement to high school course in American history for one class, not for another.	Adding the films raised learning scores of experimentals over that of controls by a critical ratio of 2.00.
Vandermeer (1945)	Some engine lathe operators taught with aid of films, others with aid of demonstrations.	Those who saw films able to complete jobs at significantly faster rate and had fewer products rejected.
Gagné and Gropper (1965)	Study of effectiveness of filmed review materials.	Filmed materials responsible for highly significant gains over no review.
Wittich (1959)	Incidental information on teachers in 83 high schools, in whose classes the Harvey White physics films were shown.	Teachers (as well as students) gained significant amount of additional information about physics from the films shown to their students.

TABLE 5

Examples of Learning from Computer-Assisted Instruction

Author	Study	Results
Atkinson (1968)	First grade students given 20 minutes tutorial daily in reading, on CAI terminal. Meanwhile, control group received similar tutorial in mathematics.	9 of 10 comparisons, on standardized post-test scores, significantly favorable to experimental groups.
Suppes and Morningstar (1969)	Large samples of 1st through 6th grade students in Mississippi schools and 3rd through 6th grade students in California schools given 10 minutes of drill per day, on CAI terminal, in arithmetic;	7 of 7 comparisons in Mississippi significantly in favor of experimental over control groups. 3 of 7 in California significantly in favor of experimental groups, 1 in favor of controls, 2 n.s.d., one contaminated.
	control groups 5 hours of classroom weekly in comprehension of written and spoken Russian replaced by comparable time at CAI terminals. Control group has regular classroom instruction, and both groups had language laboratory and homework.	73 per cent of CAI students finished year course, 32 per cent of controls. Average number of errors was lower for experimental group on all three quarterly tests, but significantly so for only one quarter.
Hansen, Dick, and Lippert (1968)	Three groups of college physics students compared. Group (a) received bulk of instruction by CAI, (b) partly by CAI, partly in class, (c) classroom only.	Group (a) significantly higher on midterm and final tests. Other groups n.s.d.
Bitzer and Boudreaux (1969)	144 nursing students taught maternity nursing and pharmacology by CAI.	Significant saving in time. One group finished material in 50 hours or less that required 84 hours in classroom

(more)

Table 5 (continued)

Author	Study	Results
Homeyer (1970)	CAI class compared with face-to-face class in advanced computer programming.	CAI students completed course in average of 13.75 hours, as compared with average of 24 hours for classroom group, and no significant difference in scores on tests of learning.
Adams (1969)	One hour a week of CAI in reading and writing German compared with one hour a week of language laboratory as supplement to three classroom hours of college German.	CAI students performed significantly better than others in tests of reading and writing German, insignificantly more poorly in listening and speaking the language.

TABLE 6

Examples of Learning from Programmed Instruction

Author	Study	Results
Tanner (1966)	Groups of low achievers in 7th grade compared, with experimental group being taught arithmetic by programmed instruction, controls by classroom teacher.	n.s.d.
Bobier (1965)	12th grade students divided into experimental and control groups, to improve mathematical skills either by programmed instruction or classroom teaching.	n.s.d.
Doty and Doty (1964)	100 introductory psychology students studied program on physiological psychology for two weeks outside class and the subject was not discussed in class.	Learning on achievement test correlated highly with student's GPA.
Attiyeh, Bach, and Lumsden (1969)	Over 400 students in 48 colleges and universities studied a programmed text on introductory economics. Divided into three groups: (a) studied program for period and attended no classes; (b) supplemented classroom teaching with programmed text; (c) classroom only.	Group (b) scored significantly higher than other groups. Group (a) significantly lower but insignificantly so, than controls.
Ashford (1968)	Taught music theory by programmed text and compared with classroom teaching.	On recall test, three years later, students taught by programmed instruction did better than those taught in classroom.

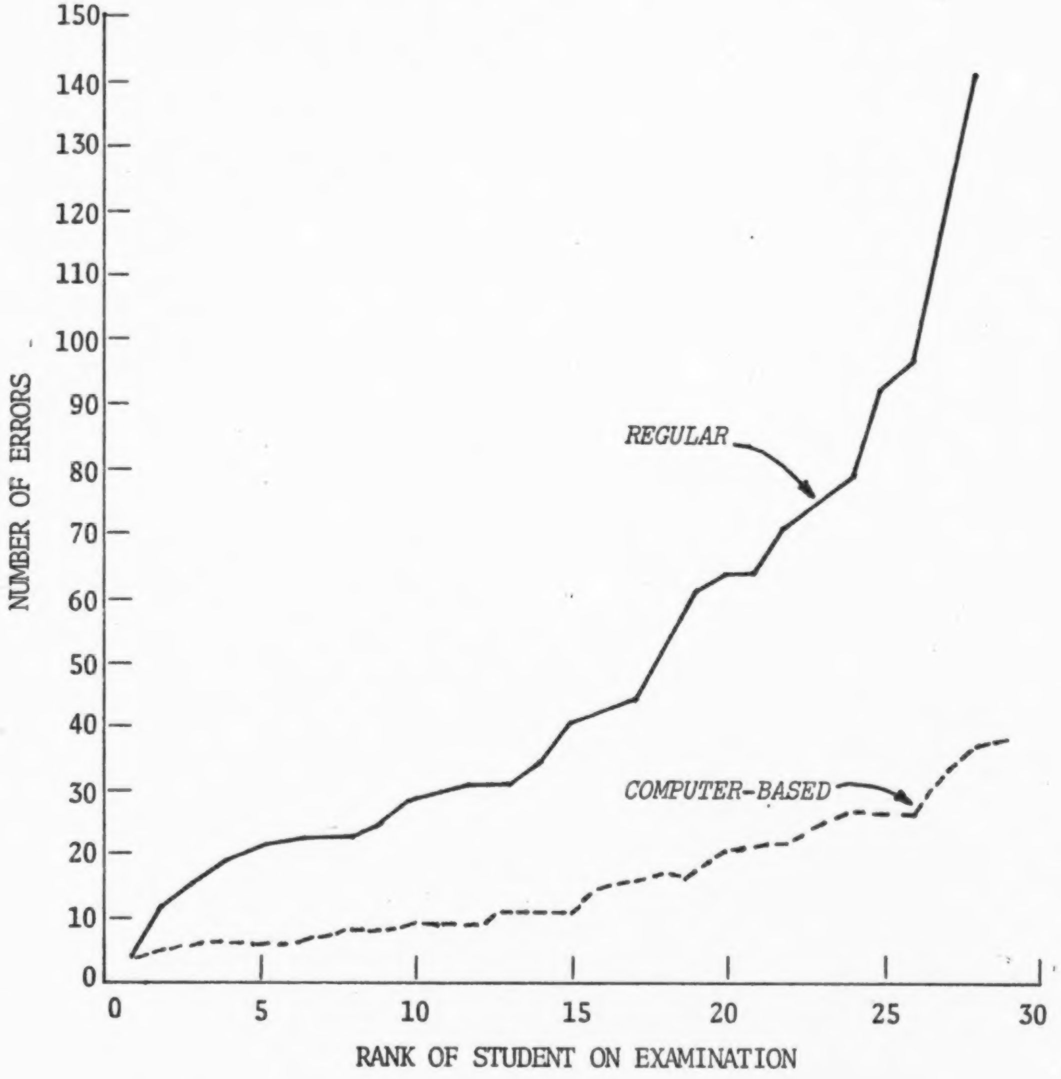

Figure 6. Student performance for the portion of the fall quarter final examination in first-year Russian that was common to the computer-based and regular sections.

(Suppes, 1971)

experimental group from 42 to 9, indicating that programmed methods tended to equalize performance even while improving it. Actually, the worst performer in the experimental group scored 44 more points than the best students in the conventionally taught group.

Radio and Smaller Media

There is less research on the less expensive, less complex media, and especially on the older and better accepted media, in part because the need to evaluate them has seemed less urgent. In the case of instructional radio, a number of the studies (which are relatively few in comparison to television) were made before the great outpouring of media research in the 1950's and without some of the careful attention to design which we come to ask of media research. The last extensive summary of research on radio as a tool of teaching appeared in the Encyclopedia for Educational Research in 1950. Since then, research has concentrated on the newer media.

Nevertheless, there is evidence, as Table 7 shows, a little of it carefully controlled, more of it from the field and less well controlled, that students do learn from radio instruction.

Research on the "smaller" media -- tapes, filmstrips, slides, transparencies, photographs, inexpensive mock-ups, and so forth -- has been scant. The research evidence, as illustrated in Table 8, is favorable.

Summary

We can say, on the basis of this evidence, that students can learn from any medium. We cannot say they always do learn; that depends on the students, the conditions, and the teaching content of

TABLE 7

Examples of Learning from Instructional Radio

Author	Study	Results
Constantine (1964)	Science taught by radio in elementary school	Students gained on the average 14 months, in one school year, on standardized test of scientific information and 15 months on standardized test of work study skills.
Heron and Ziebarth (1946)	Learning from radio lectures compared with that from classroom lectures by the same teacher in college-level psychology. Groups changed places half-way through the course.	n.s.d.
NHK (1956)	Japan Broadcasting Corporation used radio to teach English and music in 3rd, 5th, 7th grades.	Reported learning gains in every case at or above level of conventionally taught classes.
Wisconsin Research Project in School Radio (1942)	12 elementary school classes that received 25 minutes weekly of radio teaching of music plus 40 minutes of classroom practice compared with 8 classes taught same material for 75 minutes weekly in classroom.	Radio classes significantly better in tests of ability to recognize note values, read at sight, and recognize rhythms; n.s.d. on ability to take musical dictation.
Xoomsai and Ratanamangala (1960)	Very large sample study of teaching of social studies by music in 2nd and 3rd grades, English language in 6th and 7th grades, of rural Thai schools. Compared with control groups.	Experimental controls doubtful, but gains of radio groups reported as comparing very well with usual gains in those classes by conventionally taught students.
Lumley (1933)	High school students taught foreign languages with the aid of radio.	Pronunciation of students who heard radio lessons better than that of students who did not.

TABLE 8

Examples of Learning from "Smaller" Media

Author	Study	Results
Popham (1961)	Two sections of a graduate course in Education matched on aptitude and subject matter pretests; one section taught by lecture, the other by tape recordings of same lectures.	n.s.d.
Menne, Klingenschmidt, and Nord (1969)	Recorded lectures from introductory university psychology course, and provided students who so wished with their own tape recorders and printed chalkboard notes, to work at their own pace. 209 students chose to study from tapes, 408 from live lectures.	Overall, n.s.d. Lowest quartile, clear advantage for tape. Only 5 of 209 tape students dropped out of course, while 58 of 408 dropped out of lecture sections.
Eliot (1948)	Compared use of taped with live geography lessons in private secondary school.	Lower IQ students gained relatively more from tape.
Stein (1959)	Use of film loops as aid to learning typewriting.	Group with access to film loops learned to type significantly faster than group without access to loops.
Chance (1960)	83 high school students divided into four groups at random; two teachers each taught two classes, one with the aid of chalkboards, one with transparencies.	Transparencies saved about five minutes per class period.
Dworkin and Holden (1960)	Compared 60 graduate students who saw four filmstrips with tape recorded commentary on atomic bonding, with similar groups taught conventionally.	n.s.d.

Table 8 (continued)

Author	Study	Results
Twyford (1960)	Reviews Air Force studies on training materials.	Inexpensive photo mockup of plane in many respects as effective as flight simulator. No appreciable difference in supplementary learning effect of cutaways, mockups, transparencies, and manual illustrations, although cost of providing them differed considerably.

the medium. We cannot say that teaching by media is necessarily as effective as, or more effective than, conventional classroom teaching because it is almost impossible to measure all the outcomes of instruction. Most of the research studies measure achievement, defined in terms of criterion-reference or standardized tests. A few measure some of the affective results, and a few others measure time required to complete the work. But the total product of education is more than any of these; it is a changed person, with a set of values and abilities, a concept of culture and his place within it, and a living personality that governs his interactions with people and his internal life. No instructional research measures all that.

However, there is ample reason for confidence that what the instructional media can do, they can do well. This includes taking over the bulk of teaching of many subjects in the absence of direct teaching, supplementing classroom teaching with additional learning experience, providing directed and interactive practice, and in certain cases offering new opportunities to individualize learning and instruction.

Do they learn more from the Big Media?

Concerning this question we are far less confident than about the last one.

For one thing, the picture is not complete. Very few of the combinations of media and subject matter and learners have been tested in comparative studies. There is almost a complete lack of studies intended to ascertain under what conditions and for what purposes one medium may be superior to another. And a high proportion of all the experiments that do address themselves to the problem are deficient in some way, either in design or in realism. We can therefore look only for a trend, rather than a conclusion, in the existing literature.

There has long been a belief among educators that two sensory channels used for instruction make for more learning than one. This was responsible in part for the rush to use instructional television and film. The early research literature, summed up by Day and Beach (1950), came to the same conclusion: the audiovisual mode makes for more learning than either the audio or the visual mode alone. But unfortunately, these early studies almost invariably were made without the aid either of satisfactory experimental design or of significance tests. And more recent evidence has cast doubt upon them.

Broadbent's theory of perception (1958) and Travers' adoption of that theory and research on it (1964, 1966) have built upon the assumption that there is only a single channel to the higher centers of the brain. Although information may be received simultaneously from two senses, one of these inputs must be stored for a fraction of a second in a short-term memory. Inasmuch as perhaps only one per cent of the input from the ear, and perhaps only one part in 100,000 of the larger input from the eye can be utilized by the brain, interference may well occur between two inputs. Therefore, any possible superiority of two channels to one depends both on the rate at which information is presented to the two senses, and the relation of the information in the two channels.

Travers' own research supports the hypothesis that in numerous conditions the use of two channels may be less productive than one. Hartman's independent approach to the question (1960) is rather inconclusive, although it seems to lean to the side of audiovisual superiority.

This is an important line of research to media planners because the two most-used Big Media are audiovisual. Most of the Little Media serve one sense only; in fact, that is one reason why they are less expensive and less complex.

Travers and Hartman both used nonsense syllables as the subject matter for their experiments. In Table 9 we have briefed some of the better experiments that use meaningful material in comparing Big with Little Media.

Bearing in mind the incompleteness of the evidence available, we are in no position to say that either the Big or the Little Media make for more learning than the other. But this, at least, we can say: There is nothing in Table 9 to indicate any broad and general superiority for the Big Media.

Do students learn more from a combination of media than from a single medium?

The question may be faulty. Almost all teaching is multimedia. Even in the most primitive, most impoverished school, the

TABLE 9

Results of Some of the Experiments on Big vs. Little Media as Vehicles for Learning

Author	Study	Results
Heidgerken (1948)	405 student nurses, randomly assigned to one of three groups, taught introduction to nursing arts respectively by films only, slides only, or films plus slides.	n.s.d.
Grosslight and McIntyre (1955)	947 college students taught Russian vocabulary by different means. Among their comparisons were:	
	films (motion pictures) vs. slides	n.s.d.
	sound films vs. silent (this study also sums up Kale, 1953).	one n.s.d., one in favor of silent (sound interfered)
Vernon (1946)	732 Royal Navy trainees taught by films or filmstrips to take soundings. Groups equated on exams, and covariance used.	n.s.d.
Instructional Film Research Program (1954)	600 military police taught riot control by film, or filmstrips plus same soundtrack as film.	n.s.d.
Wells (1965)	594 college students randomly assigned to factorial design to test different treatments of a lesson in Introduction to Botany. Treatments were film (motion), slides, and sequential still pictures. Conclusions:	
	for concepts involving time	films best
	concepts involving motion	n.s.d.
	concepts involving space.	slides and photographs best
Hovland, Lumsdaine, Sheffield (1949)	Very large sample of military trainees, assigned to instruction by sound films or filmstrips in map reading. Groups equated on Army GCT.	n.s.d. (filmstrips performed better but only 1.3 SE)

Table 9, continued

Author	Study	Results
Westley and Barrow (1959)	228 6th grade students stratified on test of mental ability and assigned randomly to television or radio groups, for four 15-minute programs on current events. Programs used same news, but producers were told to use each medium in the best way possible.	TV > radio (after 6 weeks, n.s.d.)
Williams, Paul and Ogilvie (1957)	108 college sophomores stratified by grades, then randomly assigned to different groups including television vs. the television audio only (which they used to represent radio). Lecture on anthropology.	TV > "radio," on immediate test and after 8 months
Craig (1956)	124 students, aged 9 through 15, compared with 136 matched on common entrance examination. First group had sound films on variety of informational subjects; second saw the visual track of the films, but heard commentary by their own classroom teachers.	Silent film plus local commentary > sound films
Nelson (1951)	430 reserve officers randomly assigned to group to receive two lessons on theory and problems of flight with all possible combinations of sound and visual tracks in the two films. Comparison thus resembled sound films vs. silent vs. radio.	Group that both saw and heard both films > group that both saw and heard one film and either heard or saw the other > other groups
Tannenbaum (1956)	406 practicing dentists in post-graduate extension course. One group (N=206) heard three weekly TV lectures, one hour each; group 2 (N=10) saw film strip with TV audio; group 3 (N=12) merely read the manual that other groups also had; group 4 (N=40) saw in one day kinescopes of all three TV programs.	Group 4 > group 1 > others

Table 9, continued

Author	Study	Results
McIntyre (1966)	Randomly assigned college students (groups of 67 and 78 after absentees eliminated) taught economics by programmed instruction put together by usual method of trial, test, revision, or by a TV course revised several times in 6 years with guidance of expert judgment.	Program > ITV
Spencer (1963)	43 11th and 12th grade students assigned to group that were taught a mathematics lesson either by programmed instruction on TV or on a teaching machine	n.s.d.
Spector (1963)	Radio broadcasts, a combination of audiovisual media, and a combination of radio and the other audiovisual media compared in effort to persuade village mountaineers in Ecuador to adopt innovations.	Radio most effective in persuading people; films and other audiovisual media in conveying information

teacher will seek another channel of instruction, even if it is only a slate. "Teacher instruction" as measured in most experiments and compared with "media instruction" is usually teacher plus textbook plus chalkboard and often plus more. Thus, we have thousands of years of educational history to tell us that teachers themselves believe multi-media instruction is more effective than single media.

What the question really asks is whether adding one or more of the audiovisual or programmed media will improve instruction, when the time of instruction is held constant. This latter qualification is important. For example, Schramm and Oberholtzer (1960) accomplished impressive learning gains by adding ITV to classroom instruction in Spanish, still more by adding programmed instruction, and even more by enlisting the aid of parents to practice with students at home. However, these learning experiences could not be added without also adding time, and the result was that students who studied Spanish one period a day in school and 30 minutes at home were being compared with students who spent 25 per cent more time on it.

Nevertheless, such research as there is on this question almost invariably indicates that the addition of one or more supplementary or complementary channels of instruction makes a difference. In Table 10 we have summarized some of these studies.

TABLE 10

Some of the Studies on Multi-media Instruction

Author	Study	Results
Mathur and Neurath (1959)	Effectiveness of Radio Rural Forum (as contrasted with either farm radio or farmers' meetings alone) in 150 villages in India.	Combining discussion-and-decision group with radio broadcasts to feed the discussion brought about sensational increase in number of innovations accepted and rural improvements made.
Vandermeer (1950)	Comparison of groups of high school students taught respectively by films only, films and study guides, or conventional classroom instruction without either films or guides.	Combination of films and guides made for more learning than either of the other methods.
Whitted et. al. (1966)	Comparison of randomly assigned groups of Air Force trainees taught by automated multi-media, self-study printed materials, or conventional classroom methods.	Both automated and classroom groups learned significantly more than home study group. (We have pointed out that classroom teaching is usually multi-media anyway.)
Bryan (1961)	Chemistry and physics taught by variety of methods to students in remote Nebraska high schools too small to offer their own courses in science. Methods were (a) ITV plus correspondence, (b) ITV plus tutorial visits, (c) ITV plus correspondence plus visits.	Group (c) learned most.
Gillespie (1972)	Radio and a combination of audiovisual media compared, with Campbell's interrupted time series design, as devices to bring people to family planning clinic in Iran.	Both responsible for spectacular gains over control, but multi-media treatment accomplished significantly more.

More impressive than any of this research, however, is the example of some of the most sophisticated instructional programs in the world, like the Swedish educational systems and the British Open University. Both of these try to use whatever "media mix" a particular course and particular classes seem to require. This makes for different combinations of television, radio, textbooks, workbooks, filmstrips, kits, tape recorded material, charts, and anything else the learning task calls for. This matching requires a discrimination among subject-media combinations which is scantily supported by research, but guided by expert experience, and by the common-sense decisions mentioned in Chapter II: what subject matter requires pictorial presentation, what parts of that require motion, and so forth.

Can most media perform most instructional jobs?

The research does not permit us to test Gagné's proposition as stated. He is speaking on a micro-level -- of whether each medium can effectively provide all the necessary events of instruction, or effectively teach concepts or verbal chains or rules or any of the other types of learning he specifies. The research, for the most part, is not on that level. It deals with broader questions: whether a student can learn a given psychomotor skill (like typewriting) which is a combination of several kinds of learning and requires numerous different events of instruction from a given medium or media; or whether a student can learn enough appropriate cognitive skills from media instruction to make a good score on a mathematics or history or language test. It makes sense to believe that all types of instructional events can be provided, in some form, by any instructional medium, and that any medium can contribute to any kind of learning, if skillfully used. But the existing research permits us only to test a much broader and fuzzier question -- is any subject matter the exclusive domain of the Big or the Little Media?

Of course, not all the possibilities have been tested. CAI is so new that it has been used for comparatively few subjects. There is almost no research, as we have pointed out, on the simplest media. But such research as exists indicates a very wide sweep of usefulness for both Big and Little Media.

In the Appendix we have placed a table showing the distribution of experimental studies on two Big and two Little Media -- television, film, radio, and programmed instruction -- by subject and by educational level. One look at the table shows that television has been used for nearly every kind of subject matter at every level of schooling. Film is almost as widely used. Radio and programmed instruction appear to be a little less widely spread, for one thing because there are fewer studies on them, but the diversity of their uses is rather remarkable.

If we extend our look at the Little Media beyond the relatively few research studies on them, it will be recalled that some hundreds of programmed texts are now in wide use, and these cover a great variety of subjects, including all the subjects that are being taught by CAI -- the corresponding Big Medium. Atkinson's (1942) survey of early local broadcasting to schools in the United States shows that radio was used, before television, for some 40 different courses, representing almost all the primary school curriculum, along with some use for secondary school and kindergarten. In countries like Japan and Australia it is used for almost all the subjects in both secondary and primary school. It has apparently never had as wide use at the college level, but in the preceding pages we have seen that tape recorded lectures and language practice materials are much used in universities and colleges. And other Little Media, like filmstrips and transparencies, have proved as useful in colleges as in schools and in adult education.

Therefore, on the basis of such evidence as we have, it is difficult to argue that any subject at any level is completely outside the area to which the instructional media, Big or Little, are able to contribute. Some are more useful than others at some assignments, but the extraordinary thing is how wide their usefulness is.

Is one medium more effective than others for a given kind of person?

A person who reads little or not at all will learn more from audiovisual media than from print. A person who cannot see the screen well will learn more from an auditory medium than from a visual one. Furthermore, we like to do what we do well. Therefore, a person who reads well is likely to choose to learn from print rather than another medium. But there is insufficient evidence to let us conclude that there are any personal characteristics beyond these that make an individual "print-minded" or "picture-minded" or "auditory-minded," and consequently able to make best use of a printed, auditory, or pictorial medium.

The personal variable that has been most studied is mental ability as measured by one or more of the standard tests or by school performance. Here the general finding is that abler students, other things being equal, tend to learn more than less able students from any medium. However, students of any ability level or at any educational level will learn from any medium if, on the one hand, the content is not too difficult for them to master, and, on the other hand, the content contains material new and interesting to them. (For good examples of this, see Hoban and Van Ormer, 1950, pp. 7-17 ff.)

But when learners are stratified by measured mental ability, and exposed to different instructional media or channels, then the evidence is confusing. Some of it is illustrated in Table 11.

The reservations we have expressed earlier concerning the quality of media-comparison studies apply to some of the studies in Table 11. The results, therefore, are, if anything, indicative of a trend, rather than definitive tests of a hypothesis. But they offer very little encouragement to anyone who wants to select a medium that might be differentially effective for one ability group.

The difference seems to reside in the message, rather than

TABLE 11

Examples of Effectiveness of Learning from Different Media as Related to Mental Ability

Author	Subject matter	Results
For high ability learners:		
Dreher and Beatty (1958)	Psychology	TV > conventional
Jacobs and Biolenbacher (1959)	Science	TV > conventional
Gordon, Nordquist, Engar (1959)	Slide rule	TV > conventional
Buckler (1958)	English	conventional > TV
Curry (1959)	Mathematics	conventional > TV
For low ability learners:		
Jacobs and Biolenbacher (1959)	Science	conventional > TV
Curry (1959)	Science	conventional > TV
Dreher and Beatty (1958)	Economics	TV > conventional
Wise (1939)	History	film > conventional
Porter (1961)	Spelling	program > conventional
Tanner (1966)	Mathematics	program, conventional, n.s.d.
Gropper and Lumsdaine (1961)	Science	conventional > program
For middle-ability learners:		
Westley and Barrow (1959)	Current events	All ability groups except middle group, TV > radio

the medium -- in the difficulty of the content, and the strategies of teaching. As an example of the latter, McNeill (1962) has found that responding is especially conducive to more learning for low IQ students of programmed instruction, not nearly so useful to students who have high IQ. Campeau (1965) found that girls with high anxiety learned significantly more with feedback -- when the correct answers were given to them after they had worked a problem or given an answer. On the other hand, girls whose anxiety was low worked more efficiently without such feedback. Dick and Latta (1970), comparing CAI and programmed instruction students in mathematics, found that on the average the programmed instruction students did better, due almost wholly to the poor performance of the less able students on a fairly difficult CAI program. And Monahan (1966) found that whereas high-ability students performed equally well on two versions of a multi-media presentation, low-ability students did significantly better on a version made with their particular abilities in mind.

The significance of this evidence

What can we say, after reviewing this literature, about Gagne's three propositions?

No medium is best for all purposes. There is nothing in the evidence to dispute this.

Most instructional functions can be performed by most media. The evidence does not really permit us to test this statement, because most studies deal with broad areas of subject matter, each including a variety of instructional functions, so that the measure of learning is really a measure of average efficiency over many functions. Nevertheless, the striking thing about the record is the wide usefulness of media, Big or Little, in diverse teaching at different levels of instruction.

Media are not differentially effective for different people. We have no reason to believe that some students can make better use of print, or pictorial, or sound media than of other kinds, but the research does not really tell us much about the relation of individual differences to different media. The interaction with individual differences can be explained more convincingly by the content and the strategy than by the nature of the medium itself.

For our purposes, it might be well to rewrite these propositions, as follows:

1. People can learn from any medium, Big or Little.

2. More of the variance in learning effect can be explained within than between the media.

3. It is common sense to believe that one medium may be more effective than others for a given instructional task, but the research gives us no very clear guidelines on this.

For example, it seems reasonable that a pictorial medium might be more effective in teaching concepts of space or shape or appearance; that an audiovisual medium might be more effective in teaching concepts or rules that involve motion and change and physical relationships; that an auditory medium might be more effective in teaching chains and concepts that involve sound; that print might be swifter in teaching higher order learning such as rules or problem solving; that a programmed medium would be most efficient for providing interactive practice when a teacher does not have time to give that much individual attention to every student; that a tape might be most efficient in providing models for language practice, and so forth. But these distinctions are presently in the realm of the art of teaching and the experience of instruction, rather than the realm of research and science.

Finally,

4. There is little in the literature on learning from the media to lead an educational planner to choose a Big Medium over a Little Medium, or vice versa. This decision is more often made on the basis of considerations other than learning effectiveness.

In the following pages we are going to take up some of those other considerations.

IV

COST CONSIDERATIONS IN SELECTING BIG OR LITTLE MEDIA

Nature of the evidence

There is one major summary study of the costs of instructional media in the literature. This is by the General Learning Corporation (1968) and makes use of most of the available data, based on United States prices, up to that time. There is another very useful study by Hayman and Levin (1970) that gives a much more up-to-date treatment of CAI than the General Learning study, but is somewhat less than satisfying in its handling of television and does nothing at all with the smaller media. Miller (1969) has given rough estimates for the hourly cost of instruction by a variety of media. Beyond those, the chief data are from studies of individual projects, few of which have benefited from an adequate amount of attention by professional economists.

The General Learning Corporation study examines the costs of instructional television with six different forms of delivery -- open-circuit broadcast, closed-circuit, airborne broadcast, satellite broadcast, and distribution to school videotape recorders; also, film, radio broadcast, language laboratories, and classroom access (which means a variety of sound tapes available to classroom loud speakers when the teachers ask for them). Except for radio and classroom-access audio, it does not cover the smaller visual or audio media -- filmstrips, slides, transparencies, graphics, nor classroom tape recorders as distinguished from language laboratories or dial access. The reason for excluding these is apparently that they would not ordinarily be asked to carry the bulk of teaching, as the other devices might.

This study bases its estimates on an assumed production of 1,000 hours of instructional material per year per school system (as much as 1,600 hours when a wide area must be covered and the needs of different school systems have to be considered). This is about one-half as much production as American Samoa provided at the height of its use of television for all twelve grades of a school system, and more than the same system presently provides. It is a great deal more than El Salvador provides for three grades, Colombia for six, or Niger for five. Thus, we must keep in mind that the GLC costs are for a very heavy use of instructional media, not for the costs of using a few films in a course or presenting supplementary materials by filmstrip or tape.

For other reasons, the GLC study does not treat the interactive media, CAI and programmed instruction.

Thus, it provides estimates for two Big Media -- instructional television and films -- and for two Little Media -- instructional radio and two forms of audiotape.

How do the costs of Big and Little Media compare?

According to the GLC figures, these Big Media cost between three and 15 times as much as the Little Media, depending on the number of students served and the coverage area, and assuming that the media are used to carry a considerable part of the instructional load.

The GLC study concludes that the costs tend to cluster into two broad bands. Total costs of instructional television "fall between $30 and $40 per student per year for the local area (5% to 10% of yearly expenditures). They converge on $10 for the city and roughly the same for the metropolitan area.... The results for the audio systems, language learning laboratories, classroom dial access, and radio systems form the second band and all fall in the $8 to $10 range for the local area and in the $3 to $6 per student per year range for the city. The radio system is about $2.50 per student per year for the metropolitan area and $3.50 and $2.50 for the state and region, the lowest cost for any system" (General Learning Corporation, 1968, p. 42). The estimated cost of doing the same job with films is about $50 per student, with very little change in the case of larger audiences or broader coverage, because of the expense of duplicating and delivering films.

Here are some representative estimates from the GLC study:

TABLE 12

Media Cost Estimates per Student per Year for Carrying a Considerable Part of the Instructional Load

	For 15,000 students	150,000	600,000
ITV	$40	$10	$9
Film	$52	$50	$52
Radio	$ 9	$ 3	$ 2.50
Dial access (one speaker per classroom)	$ 8	$ 4	$ 3.50

(Source: General Learning Corporation, 1968, pp. 40 ff.)

The GLC study made no comparable estimates for CAI or programmed tests. For these we shall rely on Hayman and Levin (1970) and Miller (1969), whose papers will be taken up later in the chapter. As for the cost of the smaller visual media, such as filmstrips, which are also absent from the GLC study, we can assume that they would fall into the lower band along with radio or below it. The fundamental assumption of the GLC study -- that costs should be figured on a basis of 1,000 to 1,600 hours a year -- makes it difficult to treat some of the smaller media. For example, who would want to provide an annual 1,000 hours of filmstrips?

Data do not exist to test the GLC film or dial access estimates from actual practice, but we have some field data on instructional radio and television which might well be presented at this point.

TABLE 13

Estimates of ITV and Radio Costs from Field Projects

Medium	Place	Number of students	Per student per year
ITV	American Samoa (Schramm, 1973)	8,100, ITV carrying core of teaching	$157
ITV	Hagerstown (I.I.E.P., 1967)	21,600, ITV carrying core	$ 28
ITV	Mexico: Telesecundaria (Klees,1973)	29,000, ITV carrying core of curriculum	$ 22
ITV	El Salvador (Speagle, 1970)	25,000 - 35,000, ITV carrying core	$ 15
ITV	Colombia (I.I.E.P., 1967)	250,000, ITV carrying core of about one-third of curriculum	$ 9
Radio	Thailand (Schramm, 1973)	1,000,000, substantial part of three courses, about two per student on the average	$ 0.25

These field estimates do not fit badly on the GLC curves, and they show the importance of economy of scale as well as size of medium.

On the other hand, it is possible to use a "big" medium like television in a relatively inexpensive way for a relatively small audience. Some universities have used it that way to carry large lecture courses. We shall come back to this point later in the chapter.

Big coverage; little coverage

Media bigness or littleness has more than one dimension. We can distinguish instructional media by the cost and the complexity of their technology, but also by how many learners they can serve at the same time over how large an area. Thus, both television, which is a Big Medium in cost and complexity, and radio, which is a Little Medium in those characteristics, can carry instruction to many persons simultaneously over large areas. Film, which is a big medium in cost and complexity, cannot serve more than a few hundred people without duplicating its distributive arrangements.

Thus, we can classify the media as follows:

		Coverage Wide	Narrow
Cost, Complexity	Big	TV	Film CAI Videotape
	Little	Radio	Programmed texts Dial access Slides, filmstrips Audiotapes

The media in the left column -- wide coverage -- are less under the control of the classroom teacher, less well adapted to individual study, than are those in the right column. The teacher, rather than the station, schedules a film, a tape, or a dialed program. A student can interact with a CAI terminal on his own schedule. One of the narrow-coverage media can be repeated at the will of the teacher or the students, or it can be stopped midway and discussed, or a part of it played over. Not so, television or radio.

On the other hand, television can serve many tens or hundreds of thousands of additional learners at relatively little additional cost, once the cost of central facilities and production have been covered. Film, which also has high production costs, saves relatively little when its audience is expanded over a few thousand. It must pay the high cost of additional prints and/or a complicated and slow delivery system. CAI has high central costs, but also high delivery costs because computers are expensive.

It is useful to think of instructional media recurring costs as made up of production, distribution, and reception costs. For example, in the case of television, the production cost would be what it takes to make the programs, distribution would be the cost of delivering them, and reception would include the cost of receivers and related activities in the school. Each of these costs would include the appropriate capital charges, maintenance, and overhead. This is a good time to review the GLC summaries of production, distribution, and reception costs for different media.

First, a word of explanation. In most circumstances, central costs decrease per user or per class when media are used to serve larger audiences. For this reason, the GLC study made estimates for five situations, which they called local, city, metropolitan, state, and region. They assumed that these five areas would require the media to serve, respectively, 15,000, 150,000, 600,000, 1,000,000, and 10,000,000 students. The effect of these different coverage areas on the per student production cost of ITV can be seen in Figure 7.

Figure 7 says that the cost of programming for a system of 15,000 students would be $91 per student, which is beyond the capabilities of most schools. If the schools are willing to accept programs from a central source, that cost can be decreased. Note how dramatically it decreases as the service area grows. Programming is only a little over $10 a student at the level of the city, $6 for a metropolitan area, and $4 for a state. This is the trade-off that an educational planner faces with a medium like television: the more that programs are made to fit local needs and local curricula, the less advantage can be had from economies of scale.

The General Learning Corporation, as we have said, postulated a requirement of 1,000 hours for a local school system and a gradual increase to 1,600 for the region, and also postulated the need for a certain number of non-instructional programs and counted in their cost, too.

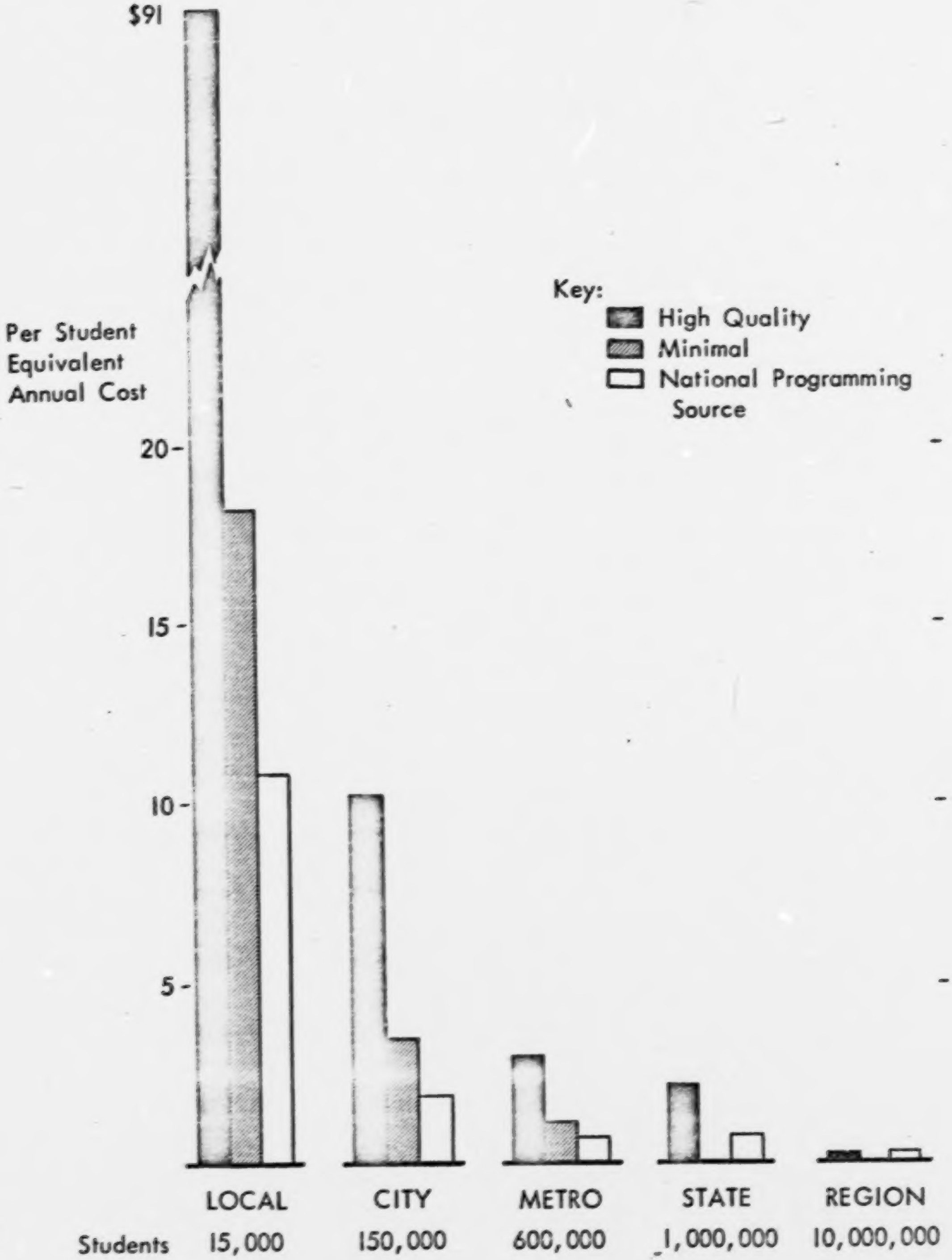

Figure 7. ITV Production Costs
(Scource: GLC, 1968)

In Figure 8 we have reproduced the GLC summary of production costs per student for different media in different coverage areas. Note that the cost of producing television and film is assumed to be very high, and the cost of film remains high regardless of coverage area because of the present practice in pricing film prints. The per capita cost of ITV production, however, declines rapidly as the audience increases. The production cost of radio is relatively high (about $4 at the local level) but, like television, benefits from the economies of scale. The production cost of material for language laboratories (or tape recorders used for language study) is really not comparable to the other media production costs because language laboratories do not need 1,000 hours of unique programming; nor is it likely that a student would spend 1,000 hours with the laboratory tapes. The GLC study, therefore, assumed the need of 225 instead of 1,000 hours of unique programming for language laboratories; if this were 1,000 hours, the production costs for language tapes in Figure 9 would be roughly four times as high as it appears on that chart. The cost of producing material for a classroom dial access system may also not be strictly comparable with the others. It is assumed that a dial access system will be used by the teacher to call up short segments of illustrative material, rather than entire lessons. Therefore, GLC assumed that the 1,000 hours for a dial access system would include readings, music, recordings of events, and the like, which are now available at low cost -- perhaps $10 an hour.

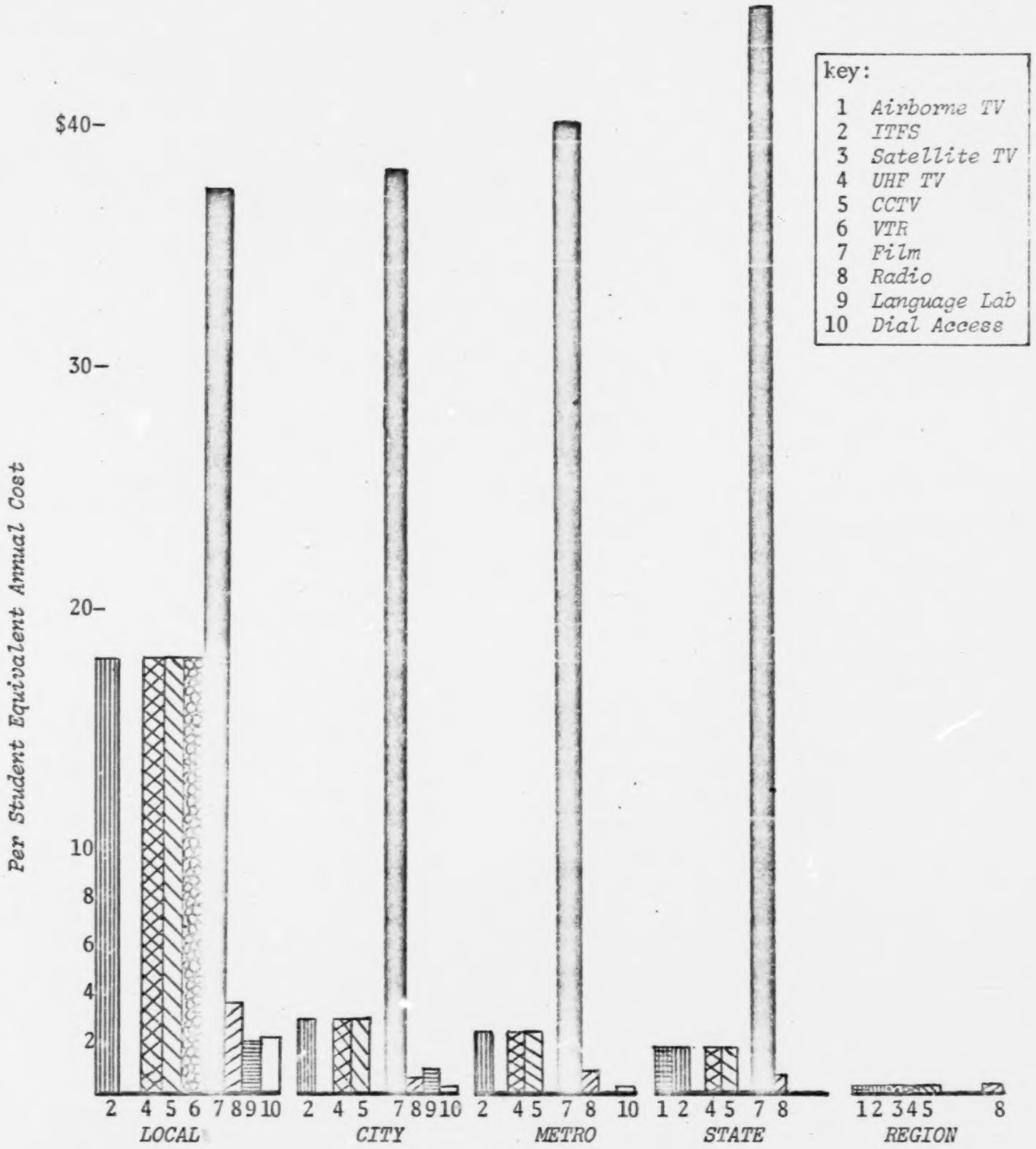

Figure 8. Production Cost Comparison

It will be noted that the chart includes a number of ways for delivering ITV -- airborne broadcasts, ITFS, satellite TV, closed-circuit, UHF, and videotape. Of course, the production cost for all these will be the same; the differences will show up in the costs for distribution.

Figure 9 compares distribution costs for the same media and the same coverage areas. Satellite and airborne television, of course, are out of the question for anything less than state coverage. VTR delivery of television is very costly for even a local area, and out of the question for larger areas, because of the high cost of videotape machines and raw tape; when videocassettes become available at low cost, the situation may be somewhat different. The least expensive way to deliver television to small areas is ITFS (2500 mH), and even that costs $6 per student in a local area. On the other hand, radio delivery is relatively inexpensive in a coverage area of any size. It is less than $2 at a local level, not more than $1 for other areas. Note that the projected delivery cost of satellite television at the regional level (the assumption is that a powerful satellite like the ATS-F will be available) is competitive with other methods of delivery. Note also that closed-circuit television is closely competitive with UHF in cost of delivery at the city level (150,000 students), although in larger areas the open-circuit system has a cost advantage.

Estimates of reception cost are shown in Figure 10. They reflect the cost of such equipment as receivers and projectors, and

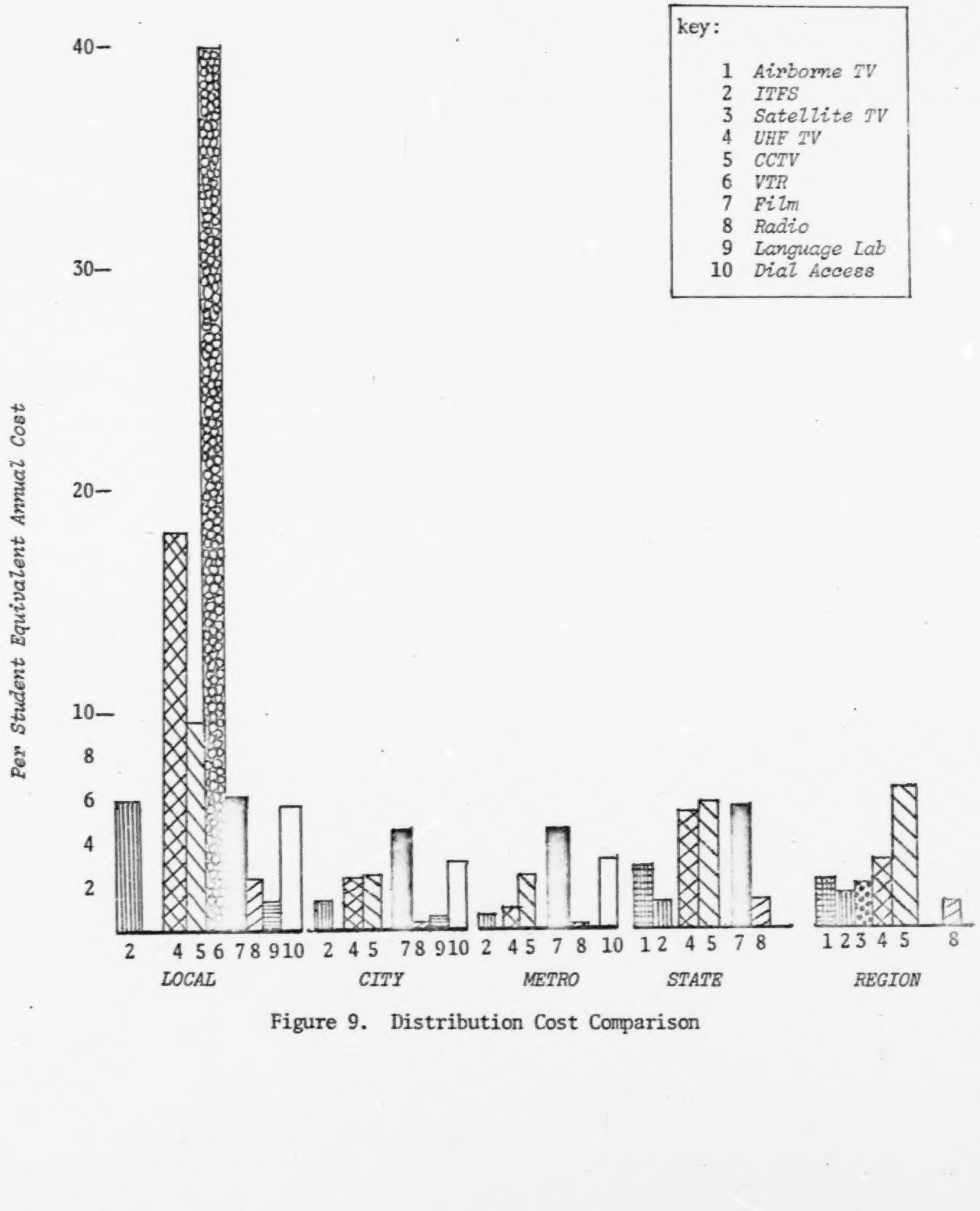

Figure 9. Distribution Cost Comparison

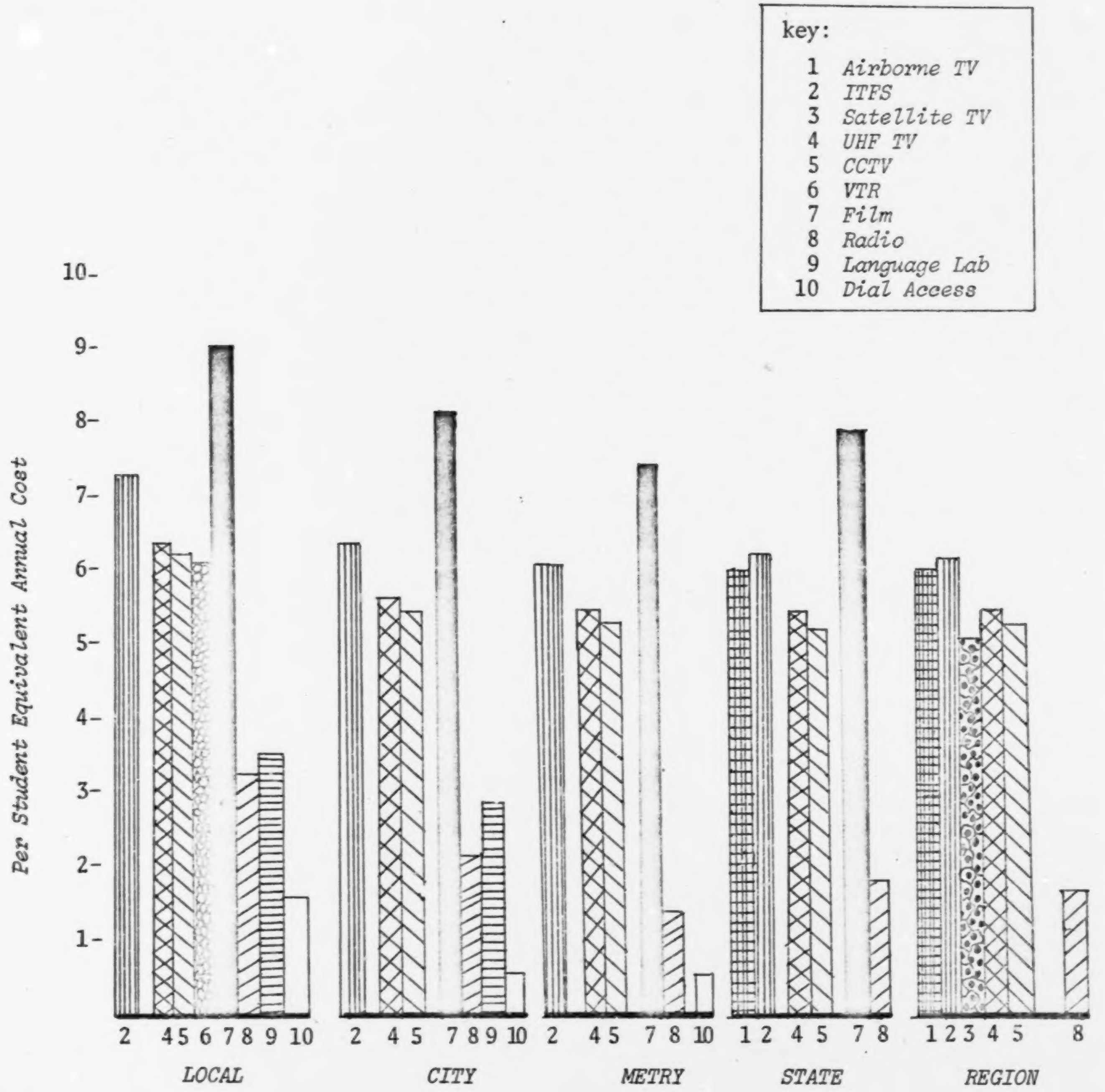

Figure 10. Reception Cost Comparison

the training of teachers to use them. It is interesting, therefore, to note that the reception cost of ITV is calculated to fall between $5 and $7, according to the coverage area, and this includes $2.50 for teacher training. We suspect that the GLC study has underestimated the cost of receiving satellite TV, especially if this is to be done by direct broadcasting. Converters for processing the satellite signal for school receivers are now costed at $300 to $750, and this is in addition to the cost of the receiver itself. If the signal is rebroadcast to school receivers, the total cost would probably still be more than UHF.

Let us now return to the total costs mentioned earlier. They are set forth in some detail in Figure 11. This chart distinguishes rather dramatically between the Big and the Little Media, insofar as they are represented in the GLC study. It is worth noting, however, that once the coverage area is expanded to 150,000 students there are several ways in which ITV can be delivered for $10 or less per year per student. Radio stands out as the bargain it is -- one-third to one-fourth the cost of television (some practitioners estimate its cost as one-tenth that of television), and the only one of these "Little" media usable for covering large areas.

Perhaps a word should be said about the film costs. These are figured on the basis of providing 1,000 hours of filmed instruction per year at the local area, increasing the hours with wider coverage. This is, of course, not the usual way that films are employed in schools. They are more often used for special tasks -- for a demonstration or a change of pace -- and it would be most uncommon

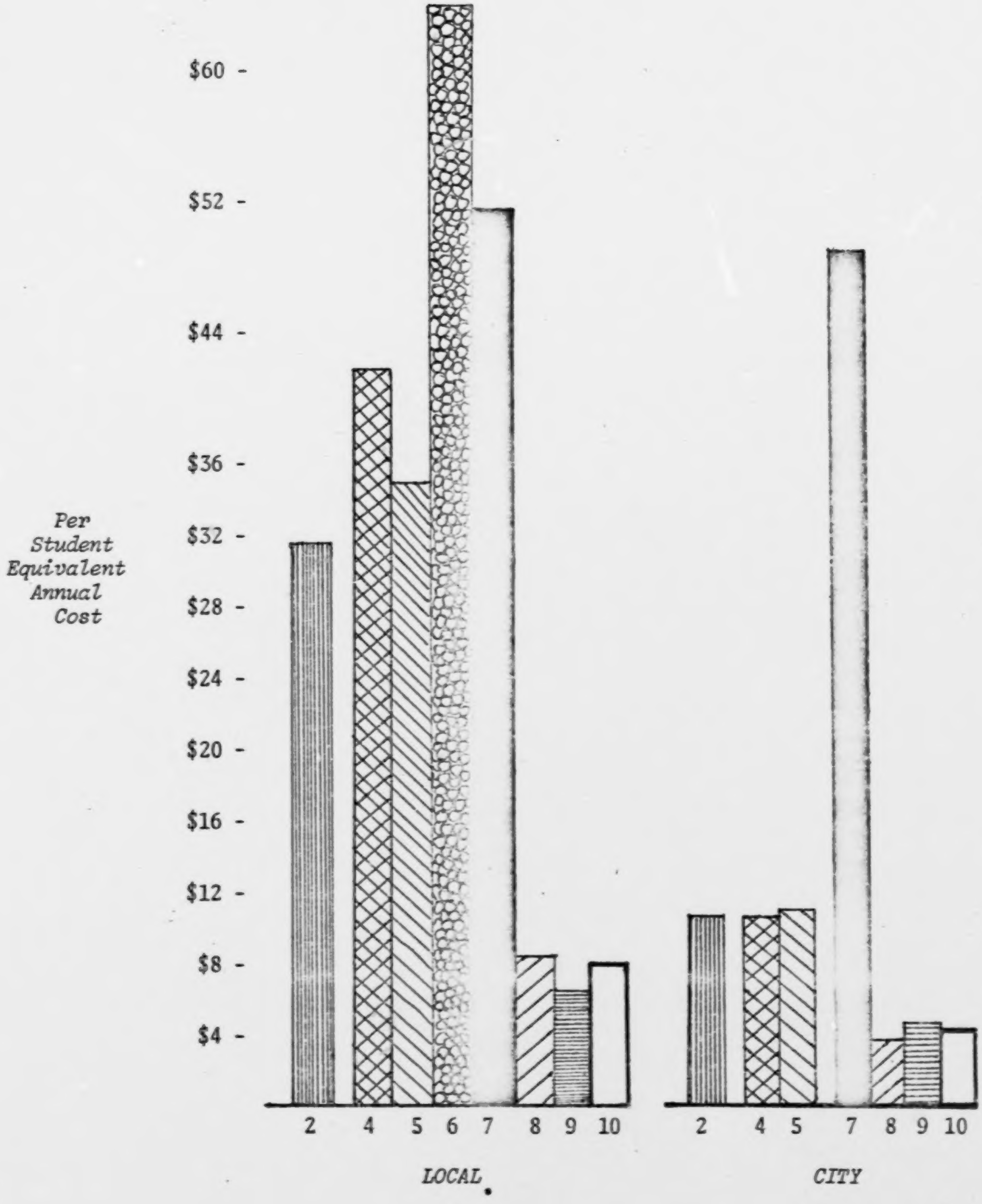

Figure 11. Estimates of total cost of media instruction.

(General Learning Corporation, 1968)

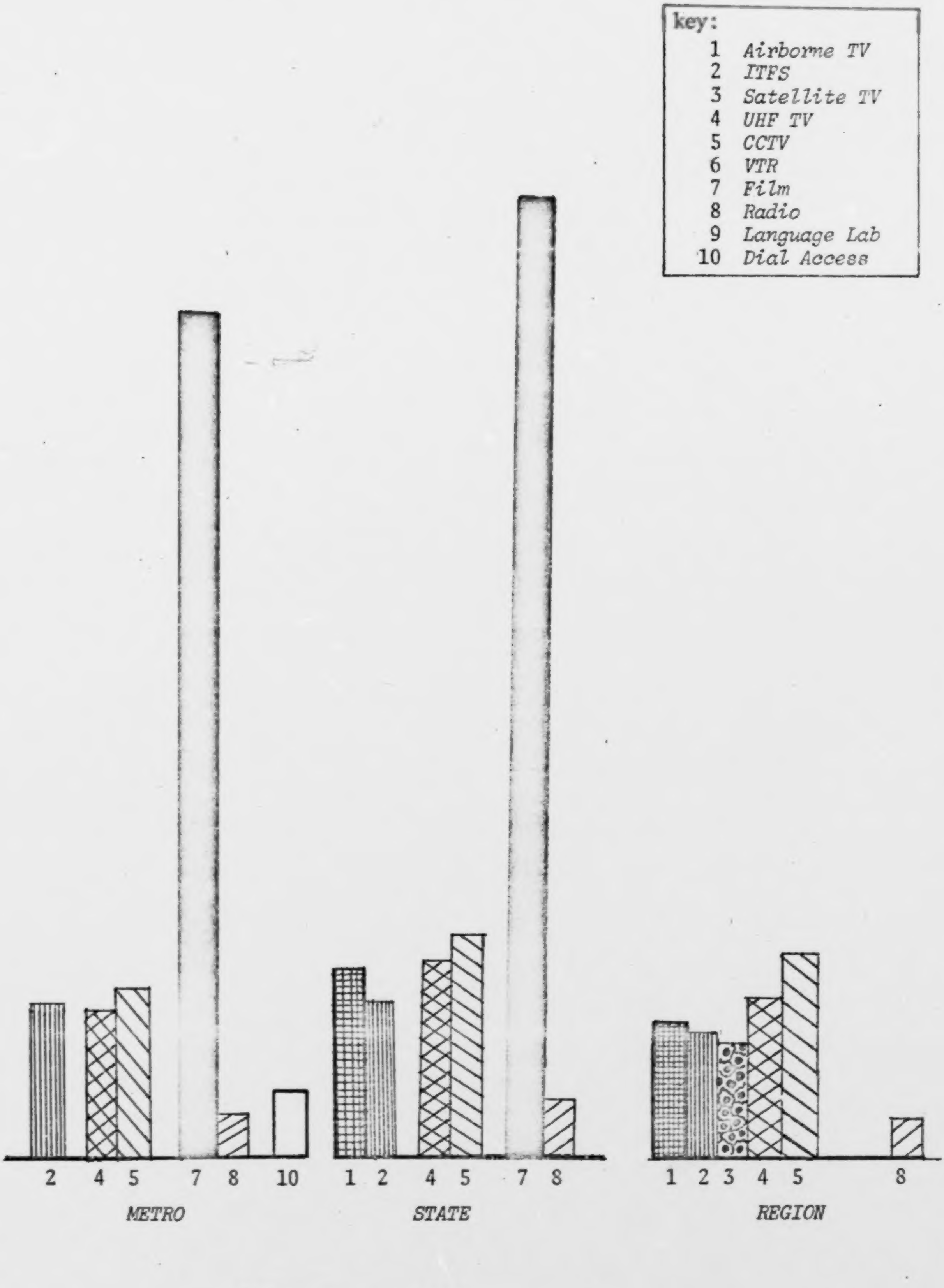

Figure 11, continued

for a school to use 1,000 hours of film a year. If the use is less, of course, the total cost would be less, but the hourly per student cost probably would be higher.

These are careful and considered estimates, and, as we have said, they check out well with available field estimates of the cost of large and extensive uses of the media. But let us not foreclose the possibility of using Big Media for small audiences or small tasks.

Instructional television has been used, on occasion, for a very few students at what seems like a very low unit cost. For example, Harrington and Knoblett (1965) reported that the break-even point for closed-circuit television in a college came when the system enrolled 350 students. At an enrollment of 450, they estimated the cost of conventional instruction at $20.67 per student per class; ITV, at $16.53. The Ford Foundation (1959) reported that Penn State University showed savings of $38,000 in one year through the use of closed-circuit television. By using television they were able to reduce the cost per student credit-unit from $9.48 for conventional teaching to $5.44 for televised instruction. The break-even point was said to come with an enrollment of 200. Reference was made also in the same report to a study at Miami University where it was claimed that televised instruction can break even with 220 enrolled. Apparently, these studies all dealt with large lecture courses, the lectures being transferred to television rather than being given in person. Whether they included capital costs, amortization, full operational costs, and general overhead, we do not know. We can assume, though, that they were using ITV in effect to pick up existing face-to-face lecturing with a minimum of the kind of program production we usually expect of large television systems.

Hayman and Levin (1971) point out that, beyond the size of audience, the cost of instructional television depends principally on the cost of instructional preparation and the cost of the particular delivery system adopted. They consider four levels of production:

> 1. Recording of a regular live classroom
> 2. A teacher presents a lesson from a prepared script in front of a studio camera, with some technical editing.
> 3. The teacher is trained and talented in the use of television techniques. Props and graphics are used freely and several rehearsals are held in preparation for recording each lesson. There may be modest use of techniques for technical editing of sound and visual tracks.
> 4. Commercial production with all its professional implications, including the use of trained performers and sophisticated systems for sound and visual effect. Complete technical editing operations would be employed. (Paraphrased from Hayman and Levin, 1971, p. 34)

For these four levels they assign the following software costs:

1. 0
2. $50
3. $6,000 (amortizable over three years, at $2,000 per year)
4. $500,000 (amortizable over five years, at $100,000 per year)

A person familiar with instructional television feels a bit uneasy with these estimates. The first one seems too low, and the largest one too high. For example, even when a live class is televised there are still some costs of doing that -- someone in the control room, for example -- and sooner or later the teacher will have to be compensated for extending the use of his lectures. Furthermore, sooner or later this kind of teaching will prove to be unsatisfactory for the students who are not in the live classroom, and there will be extra expenses in satisfying their needs. The estimate of $500,000 an hour is much higher than any existing figures from field experience. Sesame Street, which certainly had commercial production, cost $42,000 an hour from idea to tape; The Electric Company, somewhere in the neighborhood of $75,000 an hour. The British Open University pays BBC $20,000 an hour for the very professional television used in that curriculum. The typical production cost of large ITV systems, such as NHK educational programs, American Samoa, and El Salvador, is in the range of $1200 to $2000 an hour. Therefore, it is a bit hard to use those four levels and the estimates that result from them. But they do serve to underline the undoubted fact that the cost of programming -- whether television, radio, films or the smaller media -- varies greatly with the use intended and the audience to be served. If it is merely to feed a lecture to more lecture halls, the cost will be quite small -- although this is employing television simply as a delivery system and is very far from using the full possibilities of the medium. If the program has to compete with commercial programs for a non-school audience, then the costs will be of the order of Sesame Street's costs. Somewhere between these two, most educational systems will find the level at which they choose to operate, balancing cost against optimum uses of the medium.

The cost of CAI

It would be useful at this point to present a comparison of the cost of the "big" medium, computer-assisted instruction, with those of the "little" -- or at least the smaller -- medium, programmed instruction. The differences are considerable, although they may in the next years tend to converge somewhat with large audiences.

In a sense, computer-assisted instruction shows some of the cost-characteristics of instructional films. Whereas it is quite possible for a system to make its own programs, or its own films, the distribution of programmed texts, as of teaching films, has been so largely absorbed by commercial organizations that the unit costs tend to resist the economies of scale. The only way to extend the use of instructional films is to buy additional copies, at a fairly large cost, or to rent a film at a unit cost which is related to the original purchase price. Similarly, the audience for a programmed text can only be extended by purchasing additional copies, which makes the unit cost for 50,000 users not much less than the cost for 5,000.

But the decrease in unit costs of CAI has been quite dramatic. Hayman and Levin (1971) list these estimates for different years from different studies:

$5.85 per student-hour, for a college course in physics during the period 1965-69 (Hansen, et al., 1968);

$3.73 per student-hour for elementary mathematics and English courses, in the period 1968-71 (Butler, 1968);

$1.06 to $2.18 per student-hour projected for a medium size computer distributing to a few satellite centers in 1975 (by the same two studies just cited);

$0.34 per student-hour, projected for a large computer system with wide distribution to satellite learning centers in the period 1972-75 (Bitzer and Skaperdas, 1969).

This kind of comparison is not completely satisfactory because of the different assumptions used in making the estimates. Somewhat better are the estimates Hayman and Levin themselves have made, using comparable assumptions. They have drawn up five models of computer service and consequent cost -- one for 1965-69, another for 1968-70, a third for a very large computer system like the one that is expected soon to carry the "Plato" CAI services throughout large parts of Illinois, and two models representing the "present" (1971) state of the art, one for large systems, one for small. Here are their estimates, in Table 14.

To put these costs into perspective, it may be useful to recall that the costs of instructional television per student hour reported by large field projects range from $0.14 for 25,000 students in El Salvador (Speagle, 1970) to $0.50 for 6,800 students in American Samoa (Vaizey, 1967). Therefore, even the most favorable

TABLE 14

Hayman and Levin's Estimates of CAI Costs,
Taking into Account Advances in Technology over Time

Item	*Model A* *1965-1969*	*Model B* *1968-1970*	*Model C* *1972 Prototype*	*Model D* *Present* *Large* *Systems*	*Model E* *Present* *Small* *Systems*
System Capacity					
Terminals	32	192	4000	32	8
Student hours per month	4224-7552	25,344-45,312	$5.28 \times 10^5 - 9.44 \times 10^5$	4224-7552	1056-1888
Costs, distributed to system capacity (dollars per student hour)					
1. Computer	\$1.50-0.63	\$1.22-0.51	\$0.21-0.09	\$0.22-0.15	\$0.37-0.16
2. Terminal	1.80-0.75	0.59-0.25	0.73-0.31	0.73-0.31	0.73-0.31
3. Communications	incl. in 1	0.57-0.24	incl. in 2	incl. in 2	incl. in 1
Total, Hardware	3.30-1.38	2.38-1.00	0.94-0.40	0.95-0.46	1.10-0.47
4. Instructional Software	0.10-0.04	0.10-0.04	0.10-0.04	0.10-0.04	0.10-0.04
Subtotal, Items 1-4	3.40-1.42	2.48-1.04	1.04-0.44	1.05-0.50	1.20-0.51
5. Proctor	0.10	0.10	0.10	0.10	0.10
Subtotal, Items 1-5	3.50-1.52	2.58-1.14	1.14-0.54	1.15-0.60	1.30-0.61
6. Administrative Services, space	0.30	0.30	0.30	0.30	0.30
TOTAL	\$3.80-1.82	\$2.88-1.44	\$1.44-0.84	\$1.45-0.90	\$1.60-0.91

of the projected CAI costs is still considerably above the unit cost of ITV for a large system. However, the CAI costs are converging on film costs and are at a point where they are justifiable for special needs and situations.

A rough estimate of the cost of programmed instruction can be made with the assumption that a programmed text sufficient for 10 hours instruction will cost $5 to $10. The variable is how many students will use that text. If it is used by five students, then the cost per hour per student will be 10 to 20 cents; if by 10 students, then the hourly cost is five to 10 cents, which is less expensive than most television, although more costly than radio.

Some figures for comparison

In 1969, Miller provided some "ballpark" estimates of the cost of different instructional media per user per hour, which are interesting not only for comparison with the GLC figures but also because they include media not treated by GLC. The wide variation between high and low boundaries of these estimates is due in part probably to the uncertainty of available figures, in part to the differences in quality and in scale of use. Miller's figures are in Table 15.

The wide spread in estimates for each medium makes these figures rather hard to use, and yet the very fact of this variation points to the possibility of using almost any medium in a relatively inexpensive way by fitting media to situation. Miller's item for

TABLE 15

Estimates of Cost of Different Instructional Media per Hour per User (Miller, 1969)

Medium	Estimated Cost per User-Hour (Dollars)
Class lecture	.15 - 3.00
Small discussion group	.50 - 15.00
Books and journals	.05 - 10.00
Printed programmed instruction	.05 - 10.00
Computerized programmed instruction	2.00 - 25.00
Instructional radio	.01 - 1.00
Dial access audiotape recordings	.01 - 2.00
Broadcast ITV (live)	.02 - 10.00
Closed-circuit ITV (live)	.03 - 3.00
Broadcast ITV (taped)	.01 - 5.00
Closed-circuit ITV (taped)	.03 - 2.00
Dial access ITV (taped)	.50 - 5.00
Other standard audiovisual aids	.05 - 8.00

(Source: Miller, 1969, p. 71)

"other standard audiovisual aids" apparently includes films, filmstrips, transparencies, and the like, with motion pictures at the upper end of the band and still pictures at the lower. The item on "books and journals" apparently covers at its lower end library materials rather than individually-owned textbooks, which would on the average cost a student more than five cents per hour of use. Two of the most interesting items are "class lectures" and "small discussion groups." We sometimes lose sight of the fact that direct teaching costs money, and, because we have teachers in the school anyway, think of instructional media always as an add-on cost. But when it is possible to revise the use of classroom teachers -- for example, when it is possible to replace local lectures by radio or taped or even televised lectures, so as to make use of the classroom teacher for other duties or larger classes -- it may be possible to deliver additional services at an appropriate cost.

Miller's entire table has been placed in the Appendix for reference.

The significance of these figures

The General Learning Corporation study made some recommendations on the basis of the data we have presented. It said some uses of instructional media were reasonable from a financial point of view, some were not, and some were questionable. The latter uses were considered to raise questions either of production -- was it desirable to enter into that level of production for a relatively restricted audience?-- or of technical matters -- for example, is a school system prepared to equip and operate an airborne or a satellite system? In Table 16 we have adapted these recommendations (GLC, 1968, pp. 17 ff.) for easier reading. Uses they have called "reasonable" we have entered in the table as YES (it is reasonable to use medium X in situation Y). Those they consider unreasonable we have entered as NO. The questionable cases we have recorded as T? or P?, meaning that in this situation the user must consider very seriously the technical or the production problems involved.

This table says, in other words, that:

(1) The smaller media are reasonable in cost for smaller areas.

(2) Of all these media, radio is the one most widely usable over all the areas here examined.

(3) Television comes at a reasonable cost (according to GLC), under ordinary circumstances, beginning at about the middle level of the table -- to serve a large metropolitan area. (Readers may wonder why technical questions were raised about the use of open-circuit television for areas larger than the metropolitan district. The authors of the GLC study are apparently questioning whether the system wants to build additional stations and connect them.)

(4) The very broad distribution systems, satellite and airborne, become competitive in cost only over an area larger than a state (unless the state is Alaska).

TABLE 16

Is It Reasonable to use Medium X in Situation Y?
Answers from the General Learning Corporation Study

	Area				
Medium	Local	City	Metro	State	Region
Airborne TV	NO	NO	NO	T?	T?
ITFS	P?	P?	YES	T?	T?
Satellite TV	NO	NO	NO	NO	T?
Open-circuit TV (UHF)	P?	P?	YES	T?	T?
Closed-circuit TV	P?	P?	YES	YES	YES
VTR	P?	P?	T?	T?	T?
Film	P?	P?	P?	P?	P?
Radio	P?	YES	YES	YES	YES
Language laboratories	YES	YES	NO	NO	NO
Classroom dial access	YES	YES	YES	NO	NO

(Source: GLC, 1968, p. 17)

Some other considerations

But there are other elements to be considered in making the decision. What may seem "reasonable" to Sweden, Germany, Japan, or Winnetka, Illinois, as we have suggested, may not seem reasonable to a developing country. What seems reasonable to a rapidly growing educational system may not seem reasonable to a stable one.

One of the first matters the decision maker will consider is the state of his resources. Can he get the money for a Big Medium, rather than a Little one, if he wishes to? What are the competing demands for that investment? And what must he provide in addition to the medium itself?

The technical demands of an instructional media system will vary greatly with the medium chosen. For example:

	What will the media system require?					
	ITV	CAI	Radio	Films*	PI	Simple Visuals
Widespread electrical mains	Yes	Yes	No	Yes	No	Probably no
Sophisticated machinery	Yes	Yes	Not very	Not very	No	No
Difficult maintenance	Yes	Yes	Less so	Not very	No	No
Highly trained operators	Yes	Yes	Less so	No	No	No

---

*If purchased or rented, rather than locally made

Resources, other than financial, existing within the country will therefore affect the decision. Although the transistor radio can work effectively where there are no power mains, it is almost impossible for open-circuit television or CAI to do so, and difficult to operate projectors in that situation. The extensive use of computers or television calls for the existence of an electronic industry. Are there places or opportunities for training personnel? For media like television or radio, and certainly for CAI, considerable numbers of highly trained persons will be needed both on the hardware and software sides. Some planners forget that not only engineers, technicians, and program personnel will be required, but also maintenance personnel, utilization advisers, and probably evaluation personnel must be trained and available to go wherever the system reaches, and teachers themselves must be trained to use the media effectively at the receiving end.

A decision-maker must also ask about what the investment in a particular system will buy. Viewed against alternative investments of the same order, will it contribute more than other investments to the country's goals? Will it help to carry out planned changes in the system? Will it save student and teacher time (as CAI and PI have been found to do over conventional teaching) so that new learning experiences can be added? Will it make it possible to teach more students in the system? Will it increase student motivation?

At some point in the decision process the alternative choices of media must be measured against the instructional job that needs doing. For example, how large is the audience to which it is supposed simultaneously to deliver the same instruction? We can chart the alternatives thus:

Size of Medium		Size of audience to be served	
		Large	Small
	Big	ITV	Films CAI presently
	Little	Radio	Programmed texts Audiotapes Simple visuals

Is the new media system expected to carry the bulk of the instruction, or merely to furnish some supplementary experiences?

Size of Medium		How much of instruction can it provide?	
		Bulk	Supplement
	Big	ITV CAI potentially	Films CAI presently
	Little	Radio Programmed texts	Simple visuals Audiotapes

It would be an expensive investment, for example, to use television to provide a few supplementary programs per course per year, and much better to use films or one of the other media. On the other hand, if ITV is already being used extensively by many courses in a system, it would be not too expensive to add a few supplementary programs for courses not making regular use of television.

Supplementary programs, however, are usually most effectively scheduled at the time an individual class needs them. Therefore, the decision maker must take into consideration how much central control over scheduling will be required, and how much should be in local hands.

	Control over scheduling	
Size of Medium	Central	Local
Big	ITV	Films CAI
Little	Radio	Programmed texts Simple visuals Audiotapes

The same kind of question can be asked concerning whether the materials are to be made locally or centrally, but the answers are not so clear. A large educational system can afford to make its own television and its own computer programs, if it is equipped to do so, but a small one would not find that economically desirable. Locally made radio programs, because they are less expensive to produce, are more feasible for a smaller system than are television programs. Films can be made by any system that has competent film-makers, but if the films are not going to look amateurish, they will be costly and take six to 12 months in the making. Consequently, instructional films are typically rented or bought from a producer who specializes in making them. Programmed texts can be made locally, but they, too, are commonly purchased from specialists who can afford the cost of making them well. Audiotapes and filmstrips can be made either locally or purchased. Transparencies are more usually homemade.

Is the medium intended for individualized instruction? If so, television and radio are not very practical unless recorded, whereas the interactive media, CAI and programmed texts, are almost ideally suited. Is it intended to provide home instruction? If so, television and radio and programmed texts are well-suited, CAI is unlikely as yet because of the high cost of terminals, films are difficult to use in most homes, but filmstrips, audiotapes, and kits can be provided with some special effort, and cassettes may change the whole situation. Is the new medium intended to extend formal learning beyond the present schools? Then radio and television suggest themselves because they can carry a large amount of instruction over large areas.

Examination of actual projects, such as those we shall look at in the following four chapters, suggests that the part of the decision making process that is most often neglected in practice is the analysis of alternatives. Supposing that a student can learn from any medium and that any medium can contribute to a wide variety of learning objectives, still it seems obvious that some media, Big or Little, may be better suited than others to do a given educational job in a given situation. Furthermore, some are better investments than others for a given job. And in any such decision an investment should be considered in its larger implications -- against what the same investment might contribute to the society or the culture or the school if made elsewhere than in media. It is not heresy to say that in some situations an investment in teacher retraining or expansion of the teacher corps might prove to be a better investment than in instructional media, or the money intended to be spent on education in a developing country might with greater ultimate profit in some cases be put into health or roads or agriculture or small industry.

V

MEDIA FOR NATIONAL EDUCATIONAL REFORM

We turn now from the micro to the macro evidence -- that is, from experiments and theory to the large field projects. We shall deal mostly with projects in developing regions, and shall be concerned chiefly with what kinds of media have been used for different educational purposes, and what has been learned about them, not under experimentally controlled conditions for the most part but under conditions where they have been challenged to produce practical results.

The first area of educational change we are going to examine is national educational reform.

Nature of the evidence

So far as we know, there have been only four instances in which instructional media have been used massively in an effort to accomplish swift reform of a national or territorial system of education. These include, however, some of the most spectacular and most closely studied examples of instructional media in developing areas:

Place	Starting date	Serving what levels	Medium used
Niger	1964	First five grades	ITV
American Samoa	1964	All primary and secondary grades, plus preschool and adult services	ITV

(cont'd)

Place	Starting date	Serving what levels	Medium used
El Salvador	1969	7th, 8th, 9th grades; now expanding to primary school, teacher training, and out-of-school education	ITV
Ivory Coast	1971	First two grades; expanding a grade at a time to cover all six primary grades; also inservice teacher training	ITV

Research personnel were present throughout the first eight years of the Niger project, but at this writing we have only a minimum amount of hard data available from that effort. American Samoa made very little use of research during its first five years, but during the last three years has given system-wide standardized tests as well as a number of locally made criterion-referenced tests, so that a considerable amount of hard data are available. El Salvador has been studied carefully from the beginning by a resident research team. The Ivory Coast project, now only in its second year, has had difficulty getting research started. There is, however, a considerable amount of information available on all these projects, and it is possible to draw some conclusions of general interest to other potential users.

All these projects, as the table indicates, have depended upon television. Whether it is necessary to use television rather than a smaller or less expensive medium we can hardly say from the evidence: apparently no country or territory has tried to use another medium, such as radio, for the same purpose. It may well be that a large and dramatic medium like television, which is able to serve wide areas and to deliver both visual images and sound, _is_ necessary in order to catalyze change throughout a change-resistant system like education. On the other hand, there may have been a touch of opportunism in some of the decisions to use television: with a _television_ project it was possible to obtain outside financial assistance. If so, it is rather a pity that no donor agency has offered to finance a similar experiment with radio or a combination of other media and channels. But let us put off discussion of this point until we have examined and compared the four projects.

It may be helpful, at the outset, to point out that the Niger project is different from the others in one essential. Whereas the reforms in American Samoa, El Salvador, and the Ivory Coast were envisaged from the beginning as national or territorial activities and fully integrated into the educational plans and establishments of the states involved, the Niger activity was a pilot project, largely separate from the National Ministry of Education and operated mostly by experts from France. There was every hope and expectation that the pilot project would be accepted, incorporated into the development plans of Niger, and expanded throughout the country. The fact that this did not happen may tell us something about the hazards of pilot projects.

1. _The objectives were remarkably similar_

When _Niger_ entered upon its experiment in educational reform, only about seven per cent of the children of school age were in school.

From the viewpoint of the Niger government, the main objective was to find a way to expand primary school enrollment rapidly. There was also an anticipated shortage of teachers, who would be needed if schools were expanded; some way had to be found to meet this need. These were the goals as seen by Niger. On the part of the French Ministry of Cooperation, which furnished most of the financing, there were certain additional objectives, however. They wanted to test the assumptions that ITV could reduce dropouts and failures in a developing system, that it would permit the use of briefly trained monitors in place of qualified teachers (who were in short supply), that it could be used to teach French to children who had never spoken the language until they came to school, and that it could be used effectively to build a desire to learn. The combination of these two sets of objectives helps to explain how the Niger project developed as it did.

The educational reform project in American Samoa was in part a response to a sense of guilt on the part of the U. S. government that it had "neglected" the territorial schools. Universal education had been extended through high school in 1961, but the teacher corps was composed mostly of persons who had gone no farther than the ninth grade and had little command of English even though that was supposed to be the language of instruction. Primary schools were mostly one-room schools taught in open fales. A congressional committee had recommended consolidation of schools in suitable buildings, a revision of the curriculum to make it more relevant to Samoan life, and, above all, an improvement in the standard of

English in order to open doors to learning in school and permit Samoan graduates to move freely into American life if they so wished. The reform therefore was envisaged as a swift upgrading of Samoan education under the new conditions of universal participation, overleaping the time required to train teachers adequately, and concentration, especially in primary school, on mastery of English language.

El Salvador saw its "Plan Basico" -- seventh through ninth grades -- as the weakest link in its educational pipeline of manpower into economic and social development. Planners and educators felt that the quality of instruction needed to be improved generally, both for its individual effect and its national results. Wastage of manpower needed to be reduced, and enrollment rapidly expanded to full free universal education in Plan Basico without a loss in quality. The seventh, eighth, and ninth grades (now called the Third Cycle of national education) were to be merely the first targets. After the Reform was established there, it was to turn next to the Second Cycle (fourth through sixth grades), to the inservice training of First and Second Cycle teachers in the revised curriculum and new methods, and to the provision of second-chance opportunities to adults who had left school early.

The Ivory Coast, with only about 24.7 per cent of its age cohort in school in the first grade in 1967-68, 18.5 per cent in the second grade, 16.3 in the third, and 13.8 in the fourth, wanted to achieve complete university primary education (six grades) by 1980 or 1985. This was required, the national planners felt, by the country's ambitious plans for national growth. "Economic and social development must be backed up by a policy of promotion and training of manpower," they said in an official publication describing the new system.... (This) "must be viewed both as a means and objective of development." They needed a system to "reach the greatest number of people [and] at the same time give training to teachers capable of discharging their mission."

Thus, all four projects were aiming at universal, or at least greatly expanded, enrollments. For American Samoa, which already had more than 85 per cent of its school-age children in school, this was less of a problem than for the others. Niger and the Ivory Coast faced the problem of multiplying their primary school enrollments by a factor of five or more; El Salvador wanted at least to double enrollment in its Third Cycle of public education. All of the countries were concerned about the quality of the education they were offering, about "modernizing" its content and method, and making it contribute more to economic and social development.

2. All the projects had substantial outside support

None of these projects came into being without substantial assistance from outside. Niger had capital assistance in the neighborhood of $1.5 million, and more than a half million dollars annually in recurring costs, from France. France supplied 27 educators and 25 technicians, who, for most of the first seven years of the Niger program, were in sole charge of making both the new curriculum and the television programs.

Samoa, during eight years, had over 2.5 million dollars in TV capital funds from the U.S. Department of the Interior, large capital appropriations for new schools, large numbers of expert advisers, educators, teleteachers, and producers from the mainland, and generous budgetary support from the annual appropriation for American Samoa which also comes largely from Interior. Before 1964, the average annual expenditure per pupil in Samoa was between $50 and $60. By 1972, it had risen ten-fold, to between $500 and $600. Only about $150 of this represents the added costs of television; the remainder was for schools and equipment, for educators, for considerably higher salaries to Samoans, etc.

El Salvador had two grants from U.S. A.I.D., totalling $1.053 million for start-up costs, mainly technical assistance and equipment; a loan from A.I.D. of $1.9 million, largely for building; a loan of $4.9 million from the World Bank to be used mainly for new high schools; and an estimated additional $2 million in funds, equipment, and personnel, in smaller amounts than those previously mentioned, from UNESCO, UNICEF, Great Britain, Japan, and the United States. ILCE (Mexico) and UNESCO provided courses for television personnel, U.S. A.I.D. provided curriculum and production advisers, and, indirectly, a research team.

The Ivory Coast, like Niger, has had extensive help from France. This will total somewhere in the neighborhood of $5 million over the first five years, and includes technical experts, equipment, and some operating expenses. UNDP through UNESCO is furnishing about $1 million in money and people. Canada's contribution has been for printers, editors, and printing, and may total as much as $1 million. The World Bank has made a loan of $11.2 million, largely for secondary schools. Lesser help has come from West Germany, Belgium, the United States, and elsewhere. The total is in the neighborhood of $18 million.

3. They all relied upon television for core teaching

Although the television that was produced differed widely among the projects, they all depended upon it to carry the core of the teaching. That is, it was not supplementary, it was not a voluntary teaching aid that a teacher was permitted to accept or reject at will; it was an integral part of each course and of the student's schedule.

4. They all provided a great deal of support for television

An ITV "team"

All these projects had the concept of a "team" including the production personnel, the classroom teacher, and the supervisors and other semi-administrative personnel that had something to say about the teaching. They also maintained production teams that worked closely together in making the programs and related materials.

In El Salvador, these production teams were quite specific to subject matter. They included, for each course in each grade, five persons: two subject matter specialists, a tele-teacher, a producer, and a "coordinator", one of whose functions was to hunt up the visuals and film clips. The load on this team was typically to make three 20-minute programs a week and to prepare the accompanying teacher guides and pupil study books. For the five courses in each grade, five teams would produce, on the average, from 13 to 15 programs a week, between four and five hours per week for each student.

In American Samoa, the production teams were smaller and the load was heavier. In the first year, some teleteachers had to make as many as 20 programs a week, ranging from 10 to 30 minutes each. After the first year or two, the more typical load was 10 programs a week per teleteacher, and now it is five programs. American Samoa has a staff of about 20 teleteachers and half as many producers. Producers are assigned twice as many programs as the teachers. In some cases the teleteachers have the help of "research teachers" in preparing the classroom materials and in outlining the scripts. In all cases they have institutional support from the department of photography, the film library, and so on.

In both Niger and the Ivory Coast, the production staffs are large and somewhat less subject-specific than the two projects just mentioned. Subject matter specialists, of course, work on their specialty, but the rest of the team has more general assignments. In Niger a few persons are assigned to "integration" -- that is, to coordinating the programs in different subjects. France supplied educators, 25 producers, and technicians; the studio teachers and the technical staffs come from Niger. France also supplied 50 educators and broadcasters to the Ivory Coast, and UNESCO supplied 15 -- these in addition to the 146 Ivorians on the technical and production staff. In Niger, the production team took five weeks per program -- one week to work out the pedagogy, the other four for planning, producing, and recording. The Niger schedule required the team to produce 400 programs a year, 12 to 15 programs, four hours or a little more of television, per week. In the Ivory Coast it was necessary to produce seven to 8.5 hours a week.

Classroom materials

Each of the projects felt it was necessary to supply teacher guides and pupil workbooks, articulated very closely with the television programs. In the case of Niger, where monitors, rather than qualified teachers, are in the classroom, the instructions are often very detailed. For example, one set of basic materials for teachers begins this way:

> 8:00 a.m. Reception of the children
>
> Be in the school yard, greet your students with a smile.
>
> 8:30 Classes start
>
> Line up the students by size, the smaller at the head of the file. Enter the classroom as you have been taught to do. The children then sit down on their mats and you welcome them with a few words in their own language.
>
> 8:45 Language telecast: "The Meeting"
>
> The morning leads off with a musical theme. If they evince the wish to do so, let the children accompany the rhythm by clapping their hands. Then see to it that they listen and keep quiet during the telecast. At the

end of the program, strike your tambourine, and encourage the children to accompany you by clapping their hands. Vary the rhythm, but above all be sure to end on a muted sound of the tambourine.

9:00 Exploitation of the Language Telecast: "Good Morning"

Follow your instruction sheet faithfully, but do not hesitate to interrupt the work, if necessary, to inculcate good habits: keeping silence, listening attentively, watching the teacher. Do this calmly and pleasantly. . . . etc.

In other projects, where the classroom teachers are more experienced, the instructions are less detailed. But all the teachers receive a synopsis in advance of the telecasts, and suggestions as to how to make best use of the program. The students are given exercises to do, sometimes lists of unfamiliar words with definitions, sometimes suggestions for individual projects, and occasionally a self-grading test.

Feedback from the classroom

Each of the projects tried to help its production teams by obtaining a constant flow of information on how the programs were being received and what they were accomplishing in the classroom. With only 20 classrooms, Niger could do much of this by means of frequent visits from members of the ITV team. American Samoa collected comments and reports regularly from classroom teachers, and tried as often as possible to arrange for teleteachers to visit classrooms where their programs were being used. El Salvador made perhaps the most extensive efforts, among these projects, to obtain current information from the classroom. Teacher report forms were collected regularly and given to teleteachers. A group of utilization supervisors were trained, not for the traditional inspector role, but as advisers to the teachers and also to the programmers; this effort was less than completely successful, for political rather than educational reasons. Perhaps the most ambitious attempt to find out what was happening to the programs has been a series of tests of learning administered near the end of each course unit; these are graded in the classroom, and the results telephoned back to the research group and thence to the television teams. It was expected that the team would use one or more programs in the final days of the unit to cover subject matter that proved not to have been understood or retained. This, too, looked better in theory than in the hurry of producing actual television programs. The Ivory Coast provided for inspectors, school directors, and other competent observers to send in written reports. Many of these were then discussed in a daily 20-minute program for teachers. It is planned to use radio, rather than the more expensive and demanding television, for this sort of communication to the teachers.

Inservice training

Each project tried to provide continuing inservice training for its classroom teachers by means of broadcasts and sometimes meetings, in which upcoming topics and programs were discussed and also some of the problems of teaching the subject matter in the course. Among these, the inservice programs of the Ivory Coast and

American Samoa were especially interesting. The Ivory Coast broadcast a 40-minute program each Wednesday afternoon, which teachers were required to attend and to join in the discussion following the program. This broadcast was usually devoted to pedagogical problems, such as how to teach in French to a class of children who came to school speaking a variety of native languages. In addition to this broadcast, a 20-minute program was broadcast daily, as we have mentioned, dealing with more specific matters: the content of upcoming programs, and some of the problems and practices reported by supervisors, principals, and teachers.

American Samoa, during the first years of its project, placed experienced educators from the mainland in schools as principals. Their role was less to serve as administrators than as teacher counsellors and advisers. They would observe classes and discuss them with the teachers. Along with the teachers, they would view and discuss the inservice broadcast. As the mainland principals have been gradually replaced by Samoans, the role of principal has returned gradually to an administrative one.

Curricular revision

Revision of the curriculum was in the plans for all four of these projects. The most completely new curriculum was developed in Niger. The same team that was making the new curriculum was also responsible for the programs and for the training of classroom monitors, and therefore had maximum opportunity to see its plans incorporated into practice. El Salvador kept its curricular revision ahead of the introduction of television into each grade, but the revision was rather general and left much to the programmers. American Samoa was under pressure to introduce such a vast amount of television programming that there was little time for a thorough revision of the curriculum in advance. Furthermore, the curriculum had to change constantly as the initial three levels of primary expanded to eight grades, and as the pupils responded to the increased emphasis on oral English. Only in the last year have detailed and formal curriculum guides been published. The Ivory Coast accomplished some curricular revision in advance of television, although the changes were greater in method than in the substance of the classical French plan of studies. However, innovations such as the "new math" were included, and efforts were made to use examples and problems from Ivorian life.

5. It took all of them a while to get ready

None of these projects came very quickly into being. The modal time was three or four years, and for El Salvador considerably longer.

The Niger project traces back to the Gaston Berger resolution presented by the former French Minister of Education to the UNESCO Conference of 1960. This influential resolution advocated the use of new technology to speed educational development in the less developed countries. More specifically, the Niger project traces back to a UNESCO mission in that year, which made some suggestions about ways in which Niger might provide schooling for more of its children. In 1962, President Diori instructed Radio Niger to make a study of the possible use of television for schools by day and for adults in the evenings. The French Ministry of Cooperation evinced interest in this idea, and planning began in France no later than 1963. In October, 1964, a French production team of about 50 persons arrived in Niamey, and the first experimental program was presented to a test class on November 16 of the same year.

The congressional visiting committee, which we have mentioned came to Samoa in 1960, reported to Congress in 1961. Also in that year a vigorous governor, Rex M. Lee, was appointed and took office. He secured the approval of the Interior Department and Congress for some extraordinary efforts to change educational conditions quickly. In 1962, he brought to Samoa a committee from the National Association of Broadcasters, headed by Vernon Bronson, who had once been in charge of instructional television in Miami, Florida. Bronson prepared a detailed report providing for a school reform built around multiple channels of ITV. The Governor then asked an ad hoc committee of educators, headed by Dean Reller of the School of Education, University of California in Berkeley, to look at the NAEB report. After hearing from them, he adopted the Bronson report and work began in 1963 on building new consolidated schools and installing major television facilities. The first teleteachers and broadcasters from the mainland arrived in the summer of 1964. A six-week conference on curriculum and procedures was held that summer. By November of 1964 (a few weeks earlier than Niger), the station was on the air and the new system was in use.

Possible uses of instructional television had been discussed in El Salvador as early as 1960. Lic. Walter Beneke, El Salvador's Ambassador to Japan, arranged for a technical study by engineers from NHK (the Japan Broadcasting Corporation) in 1962. They reported favorably on the potential of ITV for El Salvador. In 1963, President Rivera established an Educational Television Commission, unfortunately without staff or budget, and in 1964 created a Department of Educational Television in the Ministry of Education. Ambassador Beneke returned from Japan in 1964 and was named chairman of the ETV commission. Planning then began in earnest, surveys were made of needs for trained persons and of opinions among educators, and a few people were trained in the skills of television. Inquiries were made of donor nations and international organizations concerning financial support for an educational reform project built around television, but nothing concrete happened on this front until President Sanchez heard U. S. President Johnson talk at the Punta del Este conference in 1967 of the possibility of supporting a demonstration project in ITV in Latin America. That directed the quest of funds to U.S.A.I.D. A.I.D. sent a team of experts to El Salvador to examine the feasibility of such a project. By this time, Ambassador Beneke had become Minister of Education, and was vigorously directing a reorganization of his Ministry and of the teacher training system. Advisers from the U.S., UNESCO, and elsewhere were in El Salvador by 1968, assisting with the training of television personnel, revision of the curriculum and development of the teacher training school. The first programs went out to the schools early in 1969, nine years after people began to consider the use of ITV, seven years after the first feasibility study, five years after a Department of ETV had been formed within the Ministry.

The use of ITV in the Ivory Coast was stimulated apparently by UNESCO and French experts who visited the country in 1967. The idea was accepted by President Houphoët-Boigny. Planning for Ivory Coast ITV began in France in 1967 (and has resulted in nine volumes of planning documents). Ivory Coast officials signed an accord with France and UNESCO in 1968. A center for teacher training was established at the provincial town of Bouaké in 1968, with the intention of training teachers to be principals and directors in the new schools. In 1970 and 1971 the television center was built at Bouaké in order to be near the training activities. Advisers and technicians were supplied by France, UNESCO, and Canada. And actual broadcast of programs began in the autumn of 1971.

6. But the projects were very different in certain ways

The rate of introduction

Three of the four projects, Samoa excepted, moved at a careful and measured pace into their reforms. The fact that Samoa did not gives us an interesting point of comparison.

The production team in Niger tried out all its television programs, by closed circuit, on two experimental classes during the 1964-65 school year. At the end of this time, the team found it desirable to remake, in whole or in part, about 80 per cent of the programs. During the second year, the revised programs (about 400 per school year) were presented to 20 first grade classes (800 students), and second grade programs were tried on the two experimental classes. In the third year, the second grade programs, revised as necessary, were presented to the 20 classes, while new third grade programs were tested on the two experimental ones. At this careful pace, the project moved through the five elementary grades. Unfortunately, up to this time it has never expanded beyond those 20 classes.

El Salvador began at the same pace as Niger, but with vastly larger numbers. In the first year, the initial programs were tried out on 32 seventh grade classes only. In the second year, these programs, some of them revised, were broadcast to all seventh grade classes able to receive them, and eighth grade programs were tried on 32 classes in the eighth grade. At this pace, the Reform moved through the Third Cycle, accompanied by an extensive program of retraining teachers, which we shall mention a little later. By 1973, television, teacher training, and extension of universal free education to the Third Cycle had made it possible practically to double enrollment in those three grades.

The Ivory Coast offered televised lessons in the first year of the Reform, 1971-72, to 447 first grade classes (about 20,000 students). In the following year another 979 first grade classes (about 40,000 pupils) were taught with the aid of television, and television was also introduced into the second grade. In two years, therefore, approximately 60,000 pupils were being taught, in part, by television. Meanwhile, plans were underway to expand the national television network which is intended to cover the entire country within a year or two. Presently, it covers about two-thirds of the area.

American Samoa, by contrast, offered television to all the elementary schools which could receive television, during the first year of the project, and all the high schools in the second year of the project. There was thus little opportunity to try out programs; within two years it was necessary to provide television teaching for 12 grades. By the third year of the project, about two-thirds of the students in American Samoa were in consolidated schools, with television, almost all the students by the sixth year. Introducing the new system to so many grades at once made it necessary to have an ungraded primary school (unfortunately, without teachers trained to conduct such a system). In the first year, television was presented on three levels only; after nine years, the three levels have differentiated into eight grades. However, this meant that a number of students sat in the same level for two or more years, and also that it was very difficult to record programs and use them in later years, both because the primary school was constantly differentiating into more grades and because the level of oral English competence was changing under the new emphasis on language. Thus, until about two years ago, the teleteachers in Samoa were producing 6,000 live programs per year -- a fantastic level of production unmatched by any educational station elsewhere in the world. In the first year, as we have noted, some teleteachers were responsible for 20 programs a week, and also for classroom materials to accompany the programs. The production load gradually sank to 10 programs per teleteacher per week, and now to five. But this enormous load of live programming must have had an effect on the quality of the broadcasts to the Samoan schools.

Teachers

In one very important detail the Niger project was different from all the others. The architects of that project decided to use monitors with no pedagogical training, most of them with only a primary school education, in the classroom rather than qualified teachers. This decision was made for two reasons. For one thing, looking toward a possible very large expansion of the school system, the use of monitors was expected to save money. In the second place, the project directors felt that it would be easier to prepare relatively untrained monitors to fit their new curriculum and their new ideas on pedagogy than to try to retrain teachers who were already anchored in the classical pedagogy. All the other projects used qualified teachers in the classroom, although inservice or preservice training, or both, were provided for them.

Teacher training

As we have seen, all four projects tried to provide some inservice training for their classroom teachers. The preservice training that El Salvador gave its teachers, however, was unique among the four.

With a few exceptions, every teacher in the Third Cycle in El

Salvador who was assigned to a classroom with television received a full year of retraining at the new teachers training center, with pay, before going to his new assignment. The retraining course included both subject matter and teaching method. The exceptions to this rule were the first group, who received intensive eight-week courses in the vacation period before and after their first year of teaching with television, and some teachers who had graduated from the advanced Escuela Normal Superior, who were thought to need only a short retraining course. This is the only case in our knowledge when a school system has made use of a new media project to upgrade its teacher corps by such an extensive program of retraining.

The monitors in *Niger* were given a six-week course before they were sent to do their first teaching and a refresher course before the second year. In *American Samoa* the pace of the project was so swift that there was little time for extensive retraining beforehand. The emphasis was therefore put on inservice training and summer workshops. In recent years a number of formal courses have been provided for teachers in late afternoons and summers, and teachers have been helped to extend their education in the United States. A number of Samoan teachers have now returned with advanced degrees in education.

The *Ivory Coast* offered a three-year (now two-year) course at the new teachers training center in Bouaké to teachers who were expected to become administrators in the new system and added instruction for classroom teaching with television to the curricula of one-year teacher training programs throughout the country. Teachers who were to go into classrooms with television were given a special one-month course just before the beginning of the school year.

Localness and relation to the establishment

The project in Niger, as we have said, is distinctly unlike the others in its separation from the national educational establishment. Three of the projects -- Samoa, El Salvador, Ivory Coast -- are closely integrated into the Ministry of Education of the country. In Niger, this is not the case. The 20 experimental classrooms are chiefly the responsibility of the French project staff. They made the new curriculum (which, despite being made by a foreign group, is very sensitive to the needs and experiences of the children of Niger). They hired and trained the classroom monitors who do the teaching. They are in charge of the television programs and of making the classroom materials. The subordinate technical staff is chiefly from Niger, although under the supervision of the French project staff. The studio teachers are pedagogically qualified Nigeriennes who are paid by the Ministry of Education but work under the supervision of the project leaders, and consequently feel a certain degree of divided loyalty and fear that they are apart from the mainstream of promotion and reward within the educational establishment.

If the Niger project is organizationally the most separate and the least national of these reforms, the El Salvador project is the most national and the most completely integrated into the educational system of its own country. Although El Salvador has made use of a number of advisers, the project has been from the first completely under Salvadoran control, and the planning has been in the hands of Salvadorans. Every classroom teacher, every teleteacher, every producer has been Salvadoran. The Ivory Coast project has been nationally integrated in this way except for the large production team furnished by France and by UNESCO. The American Samoa project began under the almost complete direction of American broadcasters and educators, but leadership has now almost completely been turned over to Samoans. Niger stands alone in its separateness.

Facilities

All the projects have built adequate studio facilities, and the Niger television building, with three indoor studios, an outdoor studio, and closed circuit to two experimental classrooms is quite impressive. El Salvador, also, has now erected a new production building with three studios (two presently operative), a film and tape library, a large graphic arts department, and the other things a busy station needs. This represents a very welcome change from the first years of the project when one small studio was available. The Ivory Coast has studios at Bouaké, and facilities for some outdoor shooting. Niger has only a very low-power transmitter; El Salvador, after renting time on commercial channels for four years, now has two transmitters of its own; and the Ivory Coast uses time on the national television network.

But the ITV facilities of American Samoa are one of the wonders of the Pacific. On those small islands, thousands of miles from any other television, the Samoa Department of Education has six open-circuit VHF channels, broadcasting from two towers high on a mountain over Pago Pago. Because the only efficient way to get equipment to the towers and the mountain top transmitters was by cable car, a cable railroad was built. Below the mountain, beside the headquarters of the Department of Education, is a building with four studios, 10 videotape recorders, art and photography departments, engineering repair shops, rooms for teleteachers and producers, tape storage facilities, and so forth. A radio communication system links the school administration and television centers with all the schools. It is a technical installation unmatched between Los Angeles and Tokyo.

Production

The Samoan television production more than matches these facilities. Until 1971, 6,000 live programs were being produced in American Samoa each year -- about 2,000 class hours -- covering every subject for every year of a 12-year curriculum. This production has been cut back, now, to about 2,200 programs a year, both because the expansion of the primary from three levels to seven grades has made it easier to tape programs for use in later years, and because so much television is no longer felt to be needed, especially in high school. Television used to fill about a third of a student's classroom time. This has now been reduced to about one-fourth of primary school time, and considerably less than that in high school. But the production is still very large in comparison to the other three projects.

The Niger production team was responsible for about 20 15-minute programs per week, covering French, arithmetic, and a general set of topics including some on the culture and problems of Niger. In the early grades, more than half the time is devoted to French language.

In El Salvador, five production teams per grade produce a total of 12 to 15 programs per week, covering science, mathematics, social studies, Spanish, and English. A series of Saturday morning programs for teachers has also been produced, and in the 1973 school year the schedule is being expanded to include fourth grade, primary school teacher training, and adult education.

The Ivory Coast produces 7 to 8.5 hours of programming per week. These include French, mathematics, and a general group of topics on Ivorian life, culture, and problems, much like the corresponding set of programs in Niger. Two program series for teachers, as noted, are also broadcast, one of 40 minutes, five of 20.

Summing up

Let us summarize in the form of a chart a few of the similarities and differences in the projects.

Figure 12.

	Niger	American Samoa	El Salvador	Ivory Coast
MAJOR OBJECTIVES	Expand primary enrollment, make curriculum more relevant, test ITV	Swift improvement and expansion in schools, make curriculum fit Samoan life, concentrate on mastery of English	Greatly expand enrollment in Plan Basico without loss of quality, introduce new curriculum, then turn to other parts of system	Expand enrollment in primary school, train teachers to carry load of new responsibility
OUTSIDE SUPPORT	France provided about $1.5 million capital, $600,000 annual operating	U.S. through territorial budget provided $2.5 million capital for TV, about $1 million annual operating, plus capital budget for new schools	From U.S.A.I.D. about $1 million in grant, $2 million loan; from IBRD, $4.9 million loan; from UNESCO, UNICEF, others, about $2 million	From France about $5 million over 5 years, $1 million from UNDP and UNESCO, $1 million from Canada, $11.2 million loan from IBRD
PREPARATION TIME	About two years	About three years	About nine years general, two years specific planning	About four years
USE OF TV	Core teaching	Core teaching	Core teaching	Core teaching
SUPPORT OF TV	Classroom materials, feedback, inservice training, ITV team, curriculum revision -- latter especially noteworthy in Niger	Same	Same	Same
PACE	One grade a year, never more than 800 pupils	12 grades in two years; reached every child in American Samoa in four years	One grade at a time; doubled enrollment in PlanBasico in 4 years	One grade at a time; 20,000 pupils first year, 60,000 second year
CLASSROOM TEACHERS	Monitors	Qualified teachers	Qualified teachers	Qualified teachers

Figure 12 (continued)

	Niger	American Samoa	El Salvador	Ivory Coast
TEACHER TRAINING	Six weeks before first term; repeated second year	Emphasized inservice training	Full year of retraining for each teacher	Extensive inservice training
ORGANIZATION	Almost completely separate from Niger Ministry of Education; operated as experiment under French ITV team	Integral part of Samoa Department of Education; under U.S. educators and broadcasters at first, administration now Samoan	Integral part of Ministry of Education; used advisers, but project always in Salvadoran hands	Integral part of Ministry of Education; large number of foreign experts
TELEVISION FACILITIES	One low-power TV transmitter, well-equipped production center with three studios	Six open-circuit VHF channels, two transmitter towers on mountain, four studios, 10 VTRs	Rented time on air for four years, and got along with one studio for three years; now has two transmitters of its own and building with three studios	Has building with two TV studios, one radio ; national TV network provides time
PRODUCTION	About 400 programs a year, representing about one hour a day: French, arithmetic, basic programs	6,000 programs a year (2,000 hours) until 1971; now about 2,200; all subjects in 12-year curriculum, plus preschool and adult services	13 programs per grade per week; about 500 per year in 5 subjects -- between 4 and 5 hours a week	7 to 8.5 hours a week: French, math, basal education

So these four projects that are so similar in most ways are distinctively different in others.

Let us now look at the costs and effects of the projects.

Costs

Niger

The Niger project has not had an economic cost study except in the planning stage, when it was estimated that the project would break even with the costs of traditional schooling after it reached 170,000 students. Since the total enrollment never exceeded 800, it is unrealistic to use present costs as an index of project accomplishment.

Nevertheless, a UNESCO team including one economist (Dr. W. J. Platt) reported on the current costs of the Niger project in 1969. They estimated that the recurring costs of France and Niger for the first five years of the project would total $3,875,000. The capital cost was approximately $1,500,000. For five years, then, the total cost of the project would be $5,375,000. During that time, 800 students went through five years of school each -- a total of 4,000 school years, at an apparent cost of $1,344 per year per student.

This may be slightly overestimated, because it is probably unfair to amortize all the capital expense over a period as short as five years. Even if the building were amortized over 15 years and the transmitter over 10, however (and if notional interest were counted in), the cost per student-year would still be between $1,200 and $1,300.* The average cost of traditional primary school in Niger is estimated at between $200 and $300 per pupil per year.

It is almost impossible, without a much closer study than we can make at a distance, to separate out the cost of television from other project costs. Yet, it is evident that those costs are highly sensitive to the number of viewers served, and so also are the total project costs, inasmuch as television bulks so large in the total. It was estimated that by 1973 primary school facilities would have to be provided for 260,000 children. If the project could really have been developed to serve this number, the unit costs would be quite different.

American Samoa

In 1966, John Vaizey (in UNESCO, 1967, vol. 1, pp. 37 ff.) estimated the per-pupil cost of television in American Samoa at $216 per year. He estimated the total cost of Samoan education in the same year as $357 per elementary school pupil, $598 per secondary school pupil.

Unit costs in Samoa have always been high because of the relatively small number of students to be served by the very large television system. At the time Vaizey made his estimates, the total enrollment, excluding the dependents' school, was 6,600. If enrollment were doubled, the annual cost per pupil would come down from $216 to $118; if it were tripled, to $86.

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*One aspect of the plan to save money turned out disappointingly when it was found necessary to pay monitors 17,000 CFA per month (about $68) rather than the expected 12,000 CFA ($48). This closed much of the gap between the cost of teachers and monitors.

In 1972, we made another estimate of the cost of television. At that time the enrollment was 8,100, and the process of replacing U.S. teachers, administrators, and specialists by Samoans had gone on for almost six years since Vaizey's study. We estimated the 1972 cost of television at $157 per pupil per year. Our very tentative estimate of the total cost of education per student is $568 per year, or about $521 per elementary student, $705 per secondary student. Thus, the total cost of education had risen considerably, reflecting a notable increase in the total school system budget since 1966, but the per pupil cost of television had decreased.

In making these estimates it was necessary to separate out school television from preschool and adult television. Here were the estimates we arrived at for the separate services:

	Production	Distribution	Capital Replacement	Total
School TV	860,411	163,100	251,700	1,275,211
Adult TV	390,821	51,815	108,751	551,387
Preschool TV	90,716	5,762	23,825	120,303

Amortization at an appropriate rate for different capital items, and notional interest compounded at six per cent, are included in the capital estimate.

What would be the effect on unit costs if it were possible to double the enrollment? A rough calculation suggests that if the production and transmission services would still be sufficient for the larger number of users, the cost of television would come down to approximately $90 per student. But the enrollment cannot be doubled, unless other states are served; all except a handful of students, most of whom are sick or handicapped, are in school.

Too much reliance should not be placed in this estimate because the accounting system in American Samoa does not now easily yield to a cost study of this kind. But nevertheless, the importance of economies of scale in the use of instructional television are well demonstrated by both the Niger and Samoa cost estimates.

El Salvador

When we look at the costs of ITV in El Salvador, we have a somewhat different situation. The enrollment in grades 7, 8, and 9, presently being taught with the aid of television in El Salvador, is now approximately 62,000. When Richard E. Speagle, of Drexel University, made a cost study of the El Salvador project in 1971, the enrollment was near 25,000. At that time he calculated that the annual cost of television per student (an average of nearly three programs in each of five subjects per week) was $14.40 per student per year. In 1969, the first year of the project, when only 1,340 students in the seventh grade were using television, the added cost of ITV would have been $224 per student. This is the dramatic effect of economies of scale. With 62,000 students now enrolled, with double sessions the rule and relatively little increase in the teacher corps, the time is ripe for another cost study. It is entirely possible that in this new situation, where television is helping teachers to handle more and larger classes without a corresponding increase in salary, television may no longer represent an add-on cost as compared to the Speagle estimates. It may be that the present total cost per student, with television, may be less than the corresponding cost if the system were taught in the traditional manner, which at present is about $100. Rough figuring indicates this may be the case, but a reliable answer must await a full re-examination of costs.

Carnoy (1971) feels that Speagle has underestimated the costs of ITV in El Salvador. By adding in certain capital costs, and notional interest on the investment, he suggests that the true cost may be as much as 50 per cent more than Speagle has suggested. If that is the case, then the 1971 add-on cost of television would have been about $21.60 per student, or a little less than one-fifth of the total unit cost of Third Cycle education. But Carnoy's estimates, like Speagle's, would be lower for the present situation in which enrollment has jumped to 62,000 and television reception is nation-wide. Provisional budget figures do not reflect any increase in costs parallel to increases in enrollment. All the more reason, therefore, why an updated cost study, made in the most rigorous manner, would yield useful information about the economics of ITV used for educational reform.

Two more observations should be made. For one thing, El Salvador is about to collect a bonus on its school television, by using it for other purposes. The primary school television, which begins in March of 1973, will supposedly represent an add-on cost, although a rather low one per unit because of the very large enrollments in the primary grades. It would not require large increases in class size to offset this cost. The use for primary school teacher training, and for offering adult education opportunities to persons who have had to leave public school early, represent substitute rather than add-on expenditures.

It should be considerably cheaper, that is to say, to offer teacher inservice training by television than in a teacher training school; and to offer education to adults by television than to bring them back to school. Thus, by making use of already trained production teams and already available facilities, El Salvador may be able to use television for additional tasks at very favorable cost ratios.

Ivory Coast

No cost studies have as yet been made, except planning projections, for the Ivory Coast. Such a study would be interesting to see, because with 60,000 students taught by television in the second year and over 100,000 expected to be in television in 1973-74, the unit costs should be quite favorable.

Production costs

Finally, it may be interesting to record two figures on the actual cost of producing ITV programs. This does not include the cost of transmission or reception, or of preparing teachers' guides and student workbooks. It does include, however, the cost of working out, producing, and recording the program. Samoa's best estimate of this cost is $1,550 an hour, or about $550 for a typical 20-minute broadcast. Speagle's estimate for El Salvador production is $1,280 an hour -- $427 for a 20-minute program. If Carnoy's amendment to Speagle's estimate is justified, then the hourly production costs both of Samoa and of El Salvador are in the $1,500-$1,600 range.

Effects

What have these projects bought for the cost of their instructional media? The answers must almost necessarily be less definite than the costs -- which are themselves subject to a large number of assumptions and come out differently when figured by different people.

Nevertheless, we are entitled to ask at least how the effects of these large and rather costly uses of television stack up against the objectives of the educational reforms?

Niger

Niger's basic reason for the use of instructional television was to make it possible to increase primary school enrollment which, as we have said, was estimated at that time at about seven per cent of children of primary school age. In this respect, the project was a failure. Up to the time of this writing, it has never succeeded in reaching more than 20 classrooms, 800 students. After these 800 had moved through the five grades of primary school, a second cohort of 800 was started through the pipeline. It would have seemed possible, at the very least, to put a new cohort into the first grade each year, so that in the fifth year the reform system would have been reaching 4,000 students. And indeed, the original plans had been much more grandiose -- to expand from 800 to 18,000 by 1967, and to 40,000 by 1968.

Why did nothing like this happen? In part it must have been that the Niger budget was unable to absorb large additional costs. In part it may have been due to the traditional conservatism and suspicion of the Niger rural people. But it is hard not to believe that much of it was due to the passive resistance of the educational establishment. And this in turn resulted in no small part from the fact we have noted: that the project was imported, was operated for the most part separately from the Ministry, and rejected the trained Niger teachers in favor of untrained monitors and the traditional colonial curriculum in favor of a new and different curriculum. In other words, apparently little was done to integrate the project into Niger's plans and capabilities for carrying it on. It had few supporters in the Ministry, and was largely ignored by the officials responsible for the future of education in the country.

It was treated, in other words, like a French experiment on Niger soil, and not until it came to the end of its planned cycle did the establishment show much interest in whether it continued to exist. Now there is a chance that France may contribute more money, and Niger may try to expand the system. Two thousand tested and revised programs are on tape. What future use they will have is uncertain.

On the other hand, measured against some of the French objectives -- to test the hypotheses that ITV could reduce dropouts and failures in an African culture, that it would make possible the use of (less expensive) monitors instead of qualified teachers, that it could be used to teach French effectively to students who had never spoken it before coming to school, and that it could produce programs that stimulate the desire to learn -- the project was far from a failure.

Dropouts in the television classroom were practically zero. Children came to school when they were ill, when the weather was bad, and they kept coming week after week, year after year. The monitors worked out very well; the project supervisors said that it was easier and more successful to train them to the new curriculum and the new methods than to try to retrain traditional teachers. Observers noted that the monitors established a remarkably fine rapport with the children. No very useful studies of learning from the Niger project have yet come to light. A series of criterion-referenced tests were given in the first year, and the children scored very well as measured against passing scores set by the testmakers (see Television scolaire du Niger, 1965, pp. 67 ff.). French visitors were surprised at how well the children were speaking the language after only two or three years. But the chief success of the project, by the general verdict of people who saw the 20 schools in Niger, was in the instructional programs it was able to produce.

The quality of ITV programs in many projects has been a source of dissatisfaction to project heads, to educational administrators, and to observers alike. It is perhaps ironic that higher standards are applied to television teaching than to classroom teaching, but they certainly are; and among the reasons are that television costs more and is far more public. In Niger, however, the programs have been almost universally praised by visitors. Relatively few programs were made each year (one-fifteenth as many as were made in Samoa). The pedagogical and production staffs were talented and large enough to eliminate some of the frantic quality of much ITV production. The programs were tried in advance on two classes, and remade if necessary. The result was a series of programs in which typically "les enfants sont plus acteurs que spectateurs" as Television scolaire du Niger explained (op. cit., p. 31). There was very little overt teaching on the TV tube; rather the programs tended to be like "shows for children." They kept the pupils extraordinarily interested and active, and provided many opportunities for them to act out skits they had seen on the tube, or to finish a playlet that had been begun on television -- meanwhile, of course, practicing their French and their arithmetic, and enjoying the experience hugely. Officials in the Niger educational system protested that the project was not teaching the skills and knowledge expected of the classical curriculum, and in many cases the programs were modified so as to bring them closer to the traditional pattern. To the best of our knowledge there are no reliable comparisons of what was learned in the 20 experimental schools and a comparable 20 traditional schools, but there seemed to visitors to be little doubt which classes were _enjoying_ the experience of education more.

American Samoa

The objectives of reform in American Samoa were to accomplish a swift upgrading of the system after a long period of apparent neglect, and especially to improve the use of English in the schools, both as a door to learning and a door to later entrance into the United States economy for the 40 per cent or so of Samoan school graduates who choose to go to the United States.

There is very little doubt that the second of these objectives has been achieved, so far as _oral_ English is concerned. Two linguists visited American Samoa in 1963 and 1964, just before the project began, and described the kind of English spoken by pupils and teachers. The situation they described was far different from the present standard. Four quantitative studies were made between 1966 and 1969, comparing the English language usage of students who had been in the new system for different numbers of years. We ourselves have tested all the school children on the one Samoan island that had never received television, and compared their performance with that of the children in an isolated school that had little contact with spoken English except in school and on television, and a third school that was not isolated and consequently had access to visitors as well as to English and television in school. The results of this study are impressive. Only three out of 10 children on the non-television island (who had received no part of their education in the new system) could make any English response at all to simple questions, although the Samoan schools now, as in 1964, are supposed to be conducted in English. The fourth, fifth, and sixth grades on the non-television island scored considerably below the third grade of a village school on the main island of Tutuila, which does have the benefit of television and the new system. This is true of the performance in understanding English, speaking English, and reading English. The scores we have been speaking of are for students who received all their education on the isolated island where television did not reach. However, there were five students in school on that island who had spent one or more years in school on the main Samoan island where they were taught in part by television. The scores of these five students are in some ways more revealing than the total scores. Here they are, together with the average scores of the fourth, fifth, and sixth grade students who had been taught wholly without television, and the third and sixth grades of the comparable school on the main island that was operating under the new system with television. The N's are small, but they are the total population of each school in the grades tested.

	Grade	Understanding Spoken English (Maximum=50)	Speaking English (Maximum=114)	Reading (Maximum=32)
Non-TV students on isolated island (N=10)	4,5,6	18.5	*	4.9
3rd grade students on main island (N=14)	3	32.6	69.6	12.0
6th grade on main island (N=15)	6	42.1	102.7	21.9
Student 1 on isolated island (Spent one grade on main island)	3	29	9	4
Student 2 (one grade on main island)	3	25	19	5
Student 3 (two grades on main island)	4	31	14	9
Student 4 (three grades on main island)	5	25	44	17
Student 5 (four grades on main island)	6	39	97	17

* Too little to record

In this table we are able to compare students who have had all their education in the new system,with students who have had none of their education in the new system, with students who have had part of their education in it. Those who have spent all their time in the new system, with television, do very much better in English than those who have spent no time in it; and those who have spent part of their time in the new system are between the two other groups, and, in general, the more time they have spent in the new schools, the better they do.

However, there are puzzling aspects in the research results from American Samoa. For one, the improvement in oral English seems not to have spilled over into corresponding improvement in reading skill. Standardized tests given in Samoa in 1963 and 1964 have been lost, but such evidence as survives indicates that there has been relatively little average improvement in reading in the eight years of the project. Of course, enrollments have increased, and therefore later scores may represent a less select group. But we might expect that this would also be reflected more than it is in the oral English scores.

Standardized tests given for the last three years in Samoa show that the children do much better on questions based on rote learning than on questions requiring abstract thinking or reasoning. This is a phenomenon seen also in "disadvantaged" groups on the American mainland, particularly in those who come from homes where English is not spoken or where there is no reading matter -- which also describes most Samoan homes. There is a plausible theory that one can never learn a foreign language better than his own language. If he does not have reading to practice outside school, he is unlikely to learn to read well in school. And consider the peculiarly cruel situation of the Samoan child: he is taught in a primitive form of a foreign language by a teacher who is also handicapped in that language, throughout the primary school years when the child should be filling up his mind and learning the skills of conceptualizing and reasoning and problem solving. Is a child taught that way likely to be handicapped in those skills forever? We have begun to investigate this by means of some parallel testing in Western Samoa, where the first seven school years are taught in the native language, and in American Samoa, where they are taught mostly in English.

What kind of test performance can we reasonably expect of students like those in American Samoa? Their school, for the most part, is in English. They are actively discouraged from using English at home. Unlike American children, they have no English reading material at home. In studying and taking tests in English, they are therefore "disadvantaged" -- quite as disadvantaged as many minority groups on the mainland. And if their performance on standardized tests is compared with that of mainland minority groups, they compare well. They begin school below the test norm of mainland white middle-class students, and as they move through school, most of them fall farther behind. This is precisely what the Coleman report found to be true of many Black, Puerto Rican, Spanish-American, and Native American groups on the mainland. The Samoan children typically do a little better than these disadvantaged mainland groups on arithmetic, a little worse on reading, as Figure 13 shows.

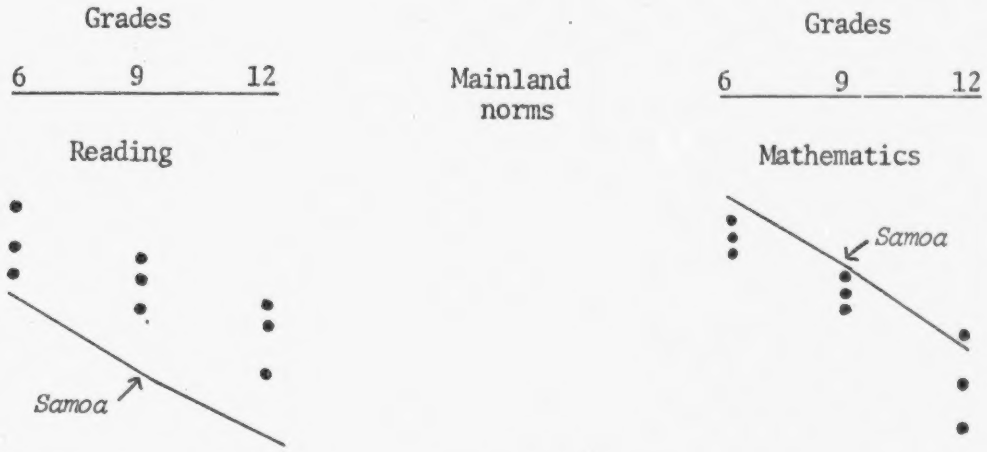

Figure 13. Comparison of American Samoa scores on U.S. standardized tests, in terms of grade levels below mainland norms, with that of three "disadvantaged" groups on the mainland. The dots represent the special groups; the line represents Samoa average public school scores in 6th, 9th, and 12th grades.

The evidence does not exist to make possible a clear comparison on Samoan test performance today with performance when the system started. Standardized testing in the last three years yields mixed results. Two years of the Stanford Achievement Test administered to the primary grades shows significantly higher scores in the second year. Three years of the SRA Achievement Test administered to high schools shows no clear trend. The only thing we can say with some confidence about trends in performance (because the Samoan project wisely or unwisely resisted such research in its first five years) is that skill in oral English clearly has improved.

In a sense, the institutional changes that have come about as a part of the educational reform are more revealing than the test scores. To an observer (as distinguished from a tester) the system looks a great deal better than it did in 1964. The new schools are attractive and efficient. The teaching seems better. Discussion in the classrooms is replacing much of the chanting of rote responses. Perhaps most important, in these last eight years the system has been turned over almost entirely to Samoan leadership. In 1964, Samoans held little except subordinate positions. The top jobs were all filled by educators from stateside. For several years now almost all school principals have been Samoans, and most of the assistant and deputy directors in the Department of Education have been Samoan. As this is written, the first Samoan Director of Education in the territory's history has just taken office. This is an accomplishment of educational reform which should not be undervalued.

The fact that television has been cut back from 6,000 live programs to 2,200 per year is a sign of maturity and rising standards, rather than lack of confidence in the medium. Teachers, especially in the secondary schools, feel better able now to teach their own classes without a crutch. Neither teachers nor administrators are any longer satisfied to have the "talking face" kind of television that almost necessarily had to be the staple diet of Samoan schools when so many programs were being produced; they are asking what television can do best, and how many programs of really high quality it can produce.

Furthermore, the appearance of detailed curriculum outlines, the establishment of a tests and measurements service, the new disposition to try different kinds of educational practices like team teaching, programmed instruction, and learning games -- developments like these represent a long jump from 1964 when the schools were mostly one-room fales in which the children chanted back whatever responses the teacher had on his memory shelves.

Therefore, despite some of the puzzling and mixed evidence, it seems possible to say that reform and ITV in Samoa have made considerable changes in the system and in what goes on in the schools. And the experience in Samoa also raises questions which must be considered in future projects of this kind elsewhere.

El Salvador

The most obvious objective of the El Salvador educational reform -- to extend universal education through the Third Cycle without loss of quality, and by so doing to relate the educational system more closely to the needs of the country for trained manpower -- has been achieved at least with regard to enrollment and quality.

Free universal education has been extended through the ninth grade, and the enrollment in the Third Cycle has approximately doubled. There is no reason (from testing evidence) to believe there has been a loss in quality. Whether the kinds of manpower that are being produced by the revised Third Cycle are contributing in any greater amount to the needs of economic and social development is not yet clear, but there are some signs that might lead us to doubt it.

Although the El Salvador project has been studied throughout its four years, the evidence still does not provide a ready answer to the question of whether quality has risen or not. Do we define quality of education as what can be learned from a criterion-referenced test? If so, there has been only one true comparison between the new system and the old. That was in the seventh grade in 1969. At that time these were the relevant comparisons between learning gains in the Old and New (ITV) System Classes in the three subjects measured:

TABLE 17

Mean Scores in Three Subjects Before and After the First Year:
New and Old System Classes, El Salvador

Subject	New System Classes	Old System Classes
Mathematics		
Mean score, February	11.79	12.22
Mean score, October	18.06	14.17
Gain	6.27	1.95
Social Studies		
Mean score, February	26.55	26.82
Mean score, October	33.77	29.43
Gain	7.22	2.61
Science		
Mean score, February	17.82	18.47
Mean score, October	23.79	19.81
Gain	5.97	1.34

In other words, the new system classes were gaining about 40 per cent; the old system classes, about 10 per cent -- so far as such gains can be measured by achievement tests of common material. Needless to say, these differences are all statistically significant beyond the .001 level of confidence.

After 1969, it was impossible to compare the old and new systems because most elements of the new system except the ITV had filtered into the classrooms that did not yet have television. Whether a class did or did not have television, it was likely to have retrained teachers, new study guides and teachers guides, and so forth. Consequently, later comparisons were of the kind that we might hope would help separate out the contribution of television to student learning. Here the data have been somewhat contaminated by incidents such as a long teachers' strike in the middle of a school year, but in general, the evidence is on the side of more learning when a class has television than when it does not. The results from the 1972 year, not yet available, should help to clear up this question.

Do we define quality as better teaching? The presence of certain qualities of "modern" teaching in the classroom have been measured -- for example, less lecturing, more discussion, more thought questions rather than rote questions, more questions asked and opinions given by students, more individual and group projects, and so forth. It was found that the new system classes had significantly more of this "modern" teaching than old system classes. The part of the teacher's experience that seemed to correlate with such teaching was the year of retraining. If a teacher had that, he was likely to teach in the way we have described; if he had not been through the retraining course, he was less likely to do so.

Do we define quality as the enjoyment of education? If so, the attitudes of students in the new system classes were distinctly favorable toward ITV, and more favorable toward school in general than were the attitudes of students in the traditional classes.

So there is considerable reason to conclude that quality has not been lost, and may well have risen, despite the increase in enrollment.

The chief evidence on what the reform is contributing to manpower comes from a study of student aspirations in the Third Cycle (see Mayo, 1971). The results of this were rather startling, for the students were aiming far above their fathers both in education and occupation. Whereas less than two per cent of the fathers had gone to universities, 40 per cent of the students were aspiring to a university education. Although 70 per cent of the fathers were working as unskilled laborers, 40 per cent of the children were aiming toward professional occupations requiring highly specialized training. These results raised questions of whether the occupational system and the higher education system of the country could possibly handle the tidal wave of students that are moving out of Third Cycle, and whether such aspirations may not lead to widespread frustration rather than filling the ranks of middle level technical employees where El Salvador most needs trained people. A study has been made of what actually happened to the Third Cycle graduating class of 1971, which was the first class to go through entirely under the new system; this will give us more information about what contributions are being made to manpower needs. Results are not yet available.

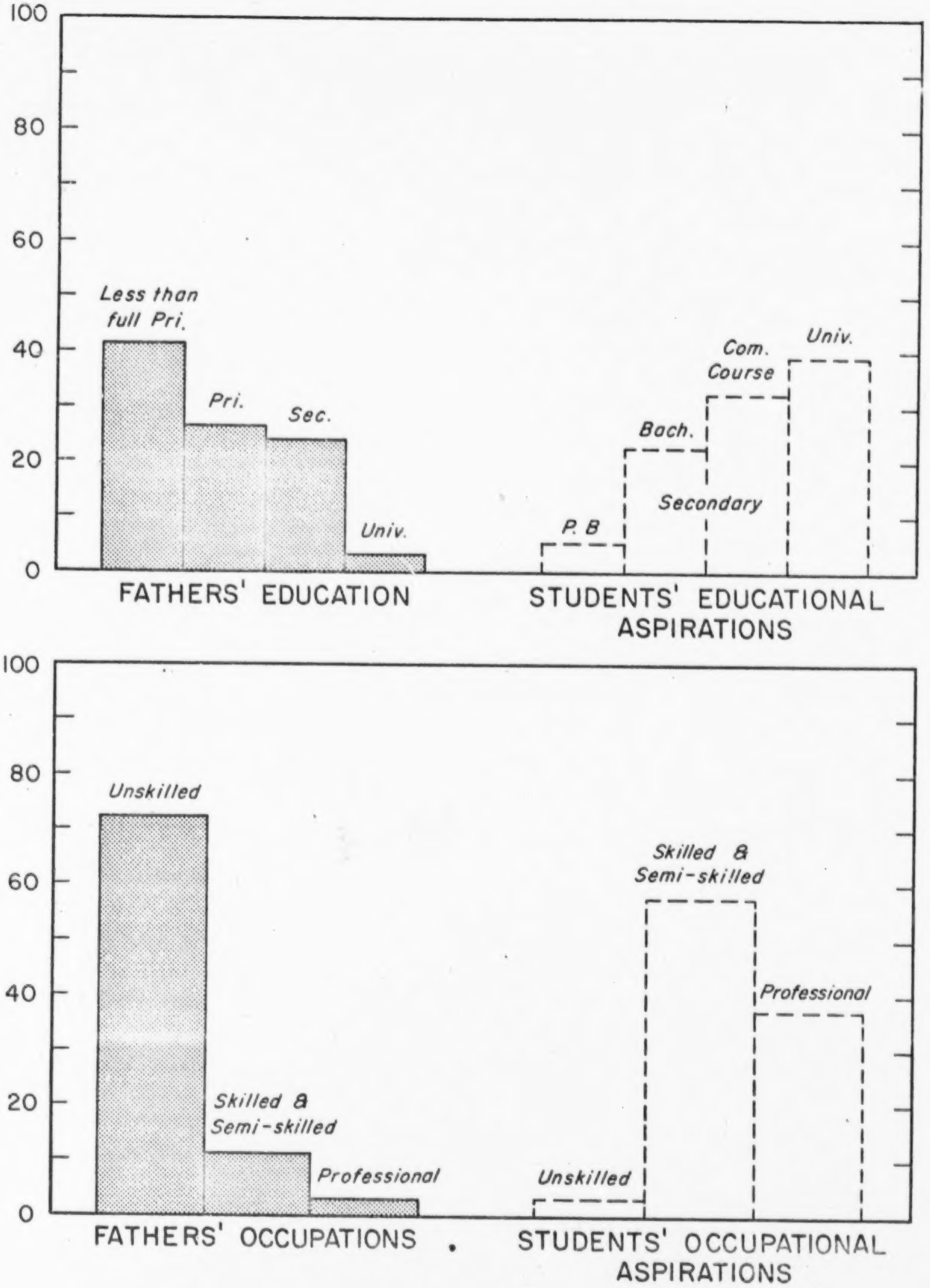

Figure 14. Fathers' education and occupations vs. students' aspirations, eighth grade, El Salvador, 1970.

When we are considering the success or failure of the El Salvador Reform, however, we must not lose sight of the fact that striking and important institutional changes were accomplished in a very short time. For example, the Ministry of Education was completely reorganized and integrated, something that had been needed for a long time but was brought about at last under the stimulus of general change. The system of teacher training was completely reorganized; most of the normal schools of the country were closed, and a new high-quality central teacher training facility was created at San Andrés. The curriculum was revised. The Third Cycle was combined with the first two cycles, and put under a single director. New and much improved study materials were made for the Third Cycle. A new concept of supervisors -- mentioned previously -- as advisers rather than inspectors was adopted and, to a certain extent, implemented. The concept of evaluation was widely spread throughout the Third Cycle. Most of the 900 teachers in the seventh, eighth, and ninth grades were given a year of retraining with pay, free from teaching duties. The "taxi-teacher," who taught an hour at one school then hurried to another, and then another, teaching the same subject, but never seeing his students outside class, was abolished and replaced with full-time teachers. These are dramatic changes, and the fact that they and others all occurred within three years indicates that the Reform movement had the power to bring about changes that otherwise might have taken many years or might never have happened.

Did television have anything to do with these changes? The school officials in El Salvador think it did. We shall discuss this matter in the following pages.

Ivory Coast

It is too early yet, and too few data are available to say how close the Ivory Coast project is to achieving its objectives. It is evident, though, that the project is moving toward the goal of universal primary education. In the first year 20,000 taught with the aid of television in first grade; in the second year, 20,000 in grade two and 40,000 in grade one. In the third year there are expected to be more than 100,000 in the new system classes.

Some conclusions

We can conclude that these projects have been able to bring about changes. They have not in every case done all that was intended, and sometimes not in the way intended, but nevertheless, each has been able to make considerable change, in a short time, in one of the most change-resistant of social institutions, the formal school system.

But we have not yet answered the question with which we began this chapter: does it have to be done with television?

There is no hard evidence on the question; apparently no one has ever tried to bring about national educational reform with radio or films or any other medium, large or small, except television. We have put the question to representatives of these reform projects. They have replied, with variations but no essential disagreement, that such a task would be harder to do without television and harder to do with a medium other than television.

Their arguments are like this:

-- the size of television and its logistic demands require a major commitment to change, and consequently make other changes easier.

-- television imposes a schedule on change. The decision to go on the air at a certain time requires curriculum revision in advance of that, requires financing to be arranged still farther in advance, requires professional training before the equipment is in hand, requires that teachers be prepared and that classroom guides and other materials be ready before ITV teaching begins in the classrooms, and so forth.

-- the dramatic quality of the technology attracts wide interest and symbolizes for a wide audience that change and "modernization" are occurring.

-- the excitement of television sometimes leads participants in a project to undertake tasks they might otherwise hesitate to attempt. This is what Hirschman was talking about when he wrote: "Since we necessarily underestimate our creativity, it is desirable we underestimate to a roughly similar extent the difficulties of the tasks we face so as to be tricked by these two offsetting under-estimates into undertaking tasks that we can, but otherwise would not dare, tackle. The principle is important enough to deserve a name; since we are apparently on the trail here of some sort of invisible or hidden hand that beneficially hides difficulties from us, I propose 'the Hiding Hand'." (Hirschman, 1967, p. 13)

-- television catches the interest of the pupils, who are inclined to think of its introduction as something new in an old routine.

-- television makes it easier to obtain financial help from outside.

-- in other words, they say, television is a mover, a catalyst of other changes in the system, and its effect as such may be more significant than its direct effect on learning.

They also feel that television can do more things than radio and is vastly easier to prepare and deliver than films.

We present these ideas for what they are worth. They come, of course, from people who have been involved in a project with television and, consequently, would perhaps be inclined to defend their use of it. We still would like to see an attempt to bring about national educational reform with radio, rather than television, as the chief media component. The evidence now says merely that television can be used as an important component of national educational reform. If another instructional medium can do as well, that remains to be proved.

From the four experiences reported in this chapter, however, we can draw some conclusions about the effective use of instructional television for widespread reform:

1. None of these projects could have gone forward successfully without substantial support -- financial, logistic, and technical -- from outside. This raises the question of whether such "forced feeding" is the best way to encourage national educational reform, or whether a simpler, less expensive method, supportable largely by local resources, might be more lasting even if somewhat slower. For example, one reason the Niger project stalled after reaching 20 classrooms was the feeling of the host government that its budget would not support a broad expansion. Similarly, the ITV station that UNESCO helped build in Senegal went dark when the UNESCO project ended. This seems wasteful of resources. On the other hand, both El Salvador and the Ivory Coast will probably be able to absorb the cost and technical demands of their national projects, although outside help was required to get them started; and American Samoa has accomplished the rather remarkable feat of Samoanizing its educational system in only eight years.

2. None of these projects could have come into existence, and none of them could have continued for very long, without strong support from the top. In Samoa it was the vigorous backing of Governor Lee; in El Salvador, the strong support of Minister Beneke; in the Ivory Coast, the support of President Houphoët-Boigny. In Niger, President Diori's interest made possible the existence of the project, and the fact that almost no other strong support existed in the government made it difficult for the project to expand beyond the experimental stage.

3. Each of these projects encountered strong resistance at some time in its development. The principle seems to be that change of such magnitude always creates a delicate situation and rouses defenses. In Niger, the opposition came from the educational establishment -- the Ministry whose curriculum and methods were rejected and who did not have control over the new classes, the Teachers Union whose members were rejected in favor of untrained monitors. In Samoa, the first opposition came from members of the Department of Education who did not believe in teaching by television; this was overcome by Governor Lee's determination to change the system quickly. Later there was political opposition, apparently using the schools as a device to strike at territorial officials. Still later, the secondary school teachers, feeling more confident, became dissatisfied with having to share so much of the teaching with the television teacher. In El Salvador, the chief opposition came from the Teachers Union, which was dissatisfied with salaries, and struck at television mainly because they felt the money it cost should have gone into higher pay for classroom teachers. In the Ivory Coast, like Samoa and Niger, not all members of the Ministry were convinced that television should be brought in to change the established patterns. A minister had to be replaced, apparently because of his opposition, and the reform put in charge of a new Secretary of State for Television and Primary Education.

4. It is at least a reasonable hypothesis that after a certain time the newness of television wears off, and after that occurs the use of television or the gadgets of television must be

somewhat changed. For example, in Samoa, after eight years, television seems to be taking on a different function -- no longer being used to carry the core of all teaching, but rather to do the things it can do best, and to be used more sparingly and more discriminatingly. The analogy is to a "spot" pitcher in baseball, who is brought in to pitch in a situation where his particular kind of skills are most useful. In El Salvador, television is being turned toward other targets -- the primary schools, the adult audience, the primary teachers who need inservice instruction -- and it is predictable that in time the amount of television used in the Third Cycle will be reduced, and its uses will become more specialized, as in Samoa. In Niger the situation is a bit different because television is supporting the monitors and, in any case, is not conceived to the same degree as presenting a "master teacher." More often it presents, as one of the leaders of the Niger project said, an instructional "show." Programs of this kind are less likely to be seen as competitive with the classroom teacher, even when the monitors grow in skill and confidence, or when qualified teachers are used in the classroom.

5. It is clear that none of these projects is really a "television" project, except in the sense that television is a principal component. Television is hardly a self-sufficient instructional tool. It needs teachers guides, study materials for students, visuals for classroom use, and all the other tools of instruction

that a live classroom needs. Looking at the experience of El Salvador, for example, one can say that the retraining of teachers was at least as important an influence on educational opportunities offered students as was television, and the provision of new and excellent teachers guides and classroom study materials was not far behind. Furthermore, institutional changes in the system of the kind we have mentioned may in the long run be responsible for more "reform" than anything television may contribute to learning. In other words, television must be built into a system, and its ability to help bring other elements of the system into existence may be more important than its direct effect on students.

6. If one introduces such a televised system faster than one grade at a time, one risks serious administrative difficulties. This is well illustrated by the experience of American Samoa, which would have found its task vastly easier technically and administratively -- although perhaps not politically -- if it had not decided to serve all 12 grades at once.

7. If a national educational reform project is expected to continue, to reach national dimensions, and to be absorbed into national budgets and plans, it needs to be integrated from the first, not only into the local culture, but also into the local power structure. This was done in El Salvador, and apparently is being done in the Ivory Coast. It was accomplished in Samoa by turning the system over to Samoan leadership and operation in eight years. It was not accomplished in Niger, where the excellent television teaching has so far been regarded as a foreign experiment, to be staffed and supported from outside.

VI

MEDIA FOR EXTENDING THE SCHOOL

In Chapter V we were able to report on four cases in which instructional media have been used in a massive way to help bring about educational reform on a national scale. In this chapter we can report on a much more widespread use of media to extend education.

Instead of four countries, at least 30 have used media to help extend the school beyond its buildings and its campuses. This has been accomplished at all levels from preschool to adult education, with a variety of media, and under greatly varying conditions. It has been done with credit courses and non-credit courses, with or without face-to-face classes or tutorial assistance, with or without correspondence study. In at least one country a program of school extension by means of radio and correspondence has been continuously carried on for 40 years. Even though the research evidence is rather spotty, this pattern of media use has been so thoroughly tried that we can speak about it with some assurance.

The development of "extended" schools

The 1960's were the decade of greatest development for media-extended schools. During this time, universities and schools alike were faced with heavy enrollments, and a number of countries were feeling affluent enough or under sufficient pressure to lead them to respond positively to the need. There was also an upsweep of popularity for adult education during that period, and strong currents in education were emphasizing the usefulness of self-study and individualized instruction.

Steering within these currents in the 1960's, educators and planners could look back over a long history of evening classes, correspondence study, agriculture and home economics extension, and other services designed to share educational resources widely. Correspondence study, in particular, has been used almost as long as there have been reliable postal services. Most correspondence schools have been privately owned and operated for profit, but in many countries, including the United States, correspondence courses have been offered by universities for academic credit. In Japan alone about 200,000 persons are now believed to be studying by correspondence, and the total number of correspondence students in the world is in the millions.

The problem with studying by correspondence has always been the isolation of the student, the lack of a schedule to encourage him to keep his work up to date, and the very high dropout rate. Australia was perhaps the first country to add radio to correspondence study in an attempt to meet some of these problems. Australia felt an obligation to offer educational opportunities to children who lived in the remote central part of the continent, far from schools, usually far from neighbors. Beginning in 1933, the Australian state school systems combined radio with their correspondence programs in the hope of adding liveness, immediacy, and motivation to the lessons. A few years later New Zealand adopted the same combination. Even today in Australia and New Zealand thousands of school children, studying at home, don their school uniforms and sing the school song along with the radio at the weekly broadcast school assembly.

Beginning in 1956, the Chicago City College offered by television a complete two-year college curriculum, leading to the degree of Associate in Arts. In some European countries experiments were under way in the 1950's to use one or other of the broadcast media in support of adult education. But the real flowering of this movement took place in the 1960's, in a great variety of form and places, as the following table will illustrate.

The variety of patterns

In Table 18 we have set down thumbnail descriptions of 18 media extension projects, most of which began in the 1960's and on all of which we have a respectable amount of information. The table begins with one project in which formal education was offered almost wholly by correspondence, and another in which it is being offered almost wholly by radio. Then it moves on to a group of projects built around radio, another group built around television, and finally a group attempting truly to be multi-media.

TABLE 18

Examples of the Use of Instructional Media to Extend the School

Country	Starting Date	Nature of Program	Under Auspices of
(Almost wholly correspondence study)			
India	1962	A number of required and elective courses offered to school-leavers who could not attend university classes on campus. Following University of Delhi, six other universities have established comparable programs. 41% of all B.A. students at Delhi have in recent years been in correspondence study. Radio programs and some television have now been added to the correspondence work.	School of Correspondence Study and Continuing Education, University of Delhi.
(Almost wholly radio)			
U.S.A.	1969	Regular college courses offered by radio in approximately same form as in classroom. Reading lists and sample exams sold for $2.00. Students already registered in University may take examinations for credit in this program free of charge; others pay $25 per examination. 15 courses offered in 1971-72, more in 1972-73. Students of radio courses will now be able to go to campus to hear tapes of classes and use other materials.	Purdue University

Table 18 (continued)

Country	Starting Date	Nature of Program	Under Auspices of
(Built around radio)			
Australia	1933	Radio-correspondence school offers 12 grades of instruction to children in remote parts of continent. Children earn diplomas and can transfer to residence schools or apply on equal terms to universities. Some of these schools now supplemented by use of "Flying Doctor's" radio, which permits radio contact with teacher and other students. Summer residence school available.	Australian state educational systems
West Germany	1966	"Funkkolleg" -- radio school for post-secondary adults, who can earn state certificates in a number of courses. Reading and study groups integral with the rest of the program.	Collaboration of state radio organization, adult education associations, universities, and Ministry of Education.
Kenya	1968	Two years of secondary school courses for teachers in service, leading to Kenya Junior Secondary Exam and promotion. Radio plus correspondence and home study exercises.	Institute of Adult Education, University of Nairobi, with support of Ministry of Education
Austria	1969	Broad course in "Living Economics" offered by radio, with textbooks, printed scripts, available for purchase, and a few group meetings arranged. State diploma for completed course.	Austria association of schools of adult education, with collaboration of federal Ministry of Education

Table 18 (continued)

Country	Starting Date	Nature of Program	Under Auspices of
Mexico	1971	"Radioprimaria" -- radio programs used to expand three-year primary schools to six years without new buildings and with minimum addition of teachers. Full school credit given.	Ministry of Education
(Built around television)			
U.S.A.	1956	Chicago TV College offers complete two-year junior college leading to degree of A.A. and possibility of transferring to four-year university. Television plus texts plus assigned papers plus, in some cases, class meetings on campus.	City educational system through Chicago City College
East Germany	1961	"Television Academy" offers variety of adult cultural and vocational subjects. Television plus some printed materials. No credit except in a few courses where the TV teaching supplements already existing credit courses.	Government broadcasting organization
Netherlands	1964	"Teleac" offers 13 to 15 courses a year in general adult education and occupational refreshers. Television plus study materials plus chances to meet together in study groups. No credit or degrees, but certificates awarded for passing courses.	Ministry of Culture, Leisure Time, and Welfare
Poland	1966	Television Technical College offers TV courses to supplement study in correspondence and evening technical schools. Courses mostly science, math, and applied technology.	State broadcasting system

Table 18 (continued)

Country	Starting Date	Nature of Program	Under Auspices of
Mexico	1966	"Telesecundaria" offers complete secondary school curriculum to groups assembled in towns that have no secondary schools. Television plus textual materials plus one teacher for entire school. Students can earn diplomas.	Ministry of Education
West Germany	1967	"Telekolleg", intermediate school preparatory to trade and technical study, offers basic language, mathematics, science, history, and technical electives to students who are working and unable to attend school. Television, correspondence study, five-hour meeting every three weeks. Leads to diploma and entrance into higher school.	Bavarian broadcasting system and Ministry of Education
France	1968	"RTS-Promotion" offers variety of courses for broadening general knowledge, learning foreign languages, and contributing to vocational and professional skills. Television, printed study materials for students willing to pay for them, in some courses correspondence study or CAI. No credit.	Institut Pedagogique National
Thailand	1969	Ramkhamhaeng University, established by parliament to take care of overflow of university applicants, offers a complete college curriculum by closed-circuit television in very large lecture halls. Textbooks are used in each course, and	University established by national parliament

Table 18 (continued)

Country	Starting Date	Nature of Program	Under Auspices of
		(Ramkhamhaeng University, continued) in some cases large discussion groups. Degrees are offered to students who complete the courses satisfactorily.	
(Built around radio and television)			
Japan	1963	"NHK Gakuen", a radio-television-correspondence high school, offers complete high school curriculum -- three years in four -- for students who did not find places in residence high school and (most of them) went to work. Students can use either radio or television, or both. Correspondence lessons, texts, one day a month and five summer days in supplementary classes. Diplomas given.	Japan Broadcasting Corporation (NHK) with cooperation of correspondence instruction association.
Sweden	1967	"TRU" (radio and television committee) offers very wide variety of courses, extending from preschool to adult education. Some lead to exams and formal credit; others do not. Some are vocational and refresher courses, some are for general adult education. Truly multi-media, using TV, radio, textbooks, correspondence, recordings, home study kits, as needed.	TRU is relatively independent, but financed by out-of-state funds and closely cooperative with Swedish Broadcasting Corporation and various adult educational organizations

Table 18 (continued)

Country	Starting Date	Nature of Program	Under Auspices of
U.K.	1971	"Open University" offers complete university curriculum, with one TV, one radio program per course per week, home study materials, some exercises to be self-corrected and some by computers, some correspondence papers marked by tutors, and study centers that provide opportunities to consult tutors, use study materials, and meet with other students. There are also opportunities for short-term residential study in the summers. Degrees are awarded.	University chartered by parliament and supported chiefly by parliamentary appropriation

What level, what media?

One of the most interesting aspects of this table is the fact that media have been used to extend schooling at every level, and in academic as well as vocational studies. Furthermore, on the basis of experience there is no very good reason to say that one particular medium is limited in its use to any particular level or levels of education. Radio and television, of course, have a special usefulness in this kind of teaching because they can deliver live teaching widely and relatively cheaply, to homes, meeting places, or schools. But programmed instruction is already appearing in many of the media-extension programs, and one can anticipate that CAI will become an important element in many of them as its costs come down. The more affluent countries are more likely to use television than radio, and adult non-credit programs that have to compete with entertainment attractions are more likely to be on television. However, one of the large land grant universities in the United States offers many of its courses by radio, and Austria teaches a non-credit course in economics very widely by radio. A developing country, looking toward this kind of teaching, can therefore be relatively confident that either radio or television will be effective, and that numerous combinations of media and learning practice can be used to fit the needs and capabilities of a given country or school system. But some trends have been appearing of which such a country should take note.

The trend toward multi-media

In the apparently successful combinations, either television or radio seems to meet two needs. In the first place, either medium provides a sense of liveness and immediacy in the teaching, and supplies visual or audio experiences that might otherwise be denied the student out of school. In the second place, either medium fulfills a scheduling function: it tends to keep the student doing his work on time and consequently, he is more likely to complete his course.

However, no single medium ever has proved entirely satisfactory for extending the experiences of schooling. The reader probably noted, in Table 18, that the University of Delhi, which had been able to teach so many of its students by correspondence study, has now found it desirable to introduce a radio program, a television program, and optional class meetings in five cities in addition to the correspondence study. Purdue University, which offered its classroom courses for credit by radio (as the Stanford School of Engineering does for many of its courses by 2500 mH television) is now recording the broadcasts so that students may come to campus or other centers and listen to them again. It also provides other study materials for use by students who want to supplement their radio classes. The Chicago Television College, which started with television and textbooks, found that it was desirable to provide consultation hours in which students could talk with teachers by telephone, and also to bring students to campus, where possible, for a few meetings each semester.

In other words, there has been a strong trend in this as in other kinds of teaching toward multi-media instruction. The simplest combination that has seemed satisfactory is either radio or television plus correspondence study.* The broadcast media, as we have noted, provide a sense of live teaching and a reason for the student to keep on schedule; the correspondence study provides learning activity and a two-way link with a live teacher who can go over the student's work and guide him. These four functions -- scheduling, liveness, student activity, two-way communication with a teacher -- seem to be highly important, except perhaps in the case of adult and non-credit courses. Other combinations serve mostly to improve or enlarge upon these functions. For example, the opportunity to consult a tutor fills even more fully the need for two-way communication and guidance. The opportunity to meet with a study group adds reinforcement and opportunity for group practice. Programmed exercises and home study science kits contribute to active learning.

Not many countries or school systems have gone as far as Sweden or the British Open University toward multi-media teaching, but the trend has been to enlarge the combinations and enrich the learning opportunities offered to out-of-school students.

The trend to active learning

Textbooks, or similar printed materials, are almost universal in these instructional patterns, but more and more attention has been to the problem of how to keep the student learning actively. This has been one of the chief purposes of the correspondence assignment which has to be turned in every two weeks or every month. Programmed instruction is a very promising tool for this purpose inasmuch as exercises do not have to be corrected centrally. Computer-corrected exercises, which can be quickly returned to the student, have also been used. Home study kits provided for science students by the British Open University are designed to let a student learn science by practicing it in his own environment. The use of radio transceivers in the "Flying Doctor" system in Australia has made it possible for a certain number of radio-correspondence students to exchange ideas and questions with their teachers and fellow students and practice some skills, such as reading aloud, that would be difficult to demonstrate by correspondence. And related to this are a number of plans (like the "School without Walls") which are designed to help the non-resident student make active use of his whole environment for instruction.

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*No country seems yet to have found a feasible way to perform this media function by circulating films or tapes, although meetings and study groups have been used to substitute for correspondence.

The trend toward "open" entrance

Still another trend, which promises to become even more important, is a challenge to the entrance requirements of resident school systems and universities. In general, the schools-out-of-school have been more permissive than ordinary schools in accepting students without entrance examinations and sometimes without the required previous education. Surprisingly enough, many of these students have done very well. The British Open University, where

17,000 out of 19,000 students in the first year did not have A-level qualifications, proved that. Most of the students in the NHK Gakuen did not have good enough records to earn places in resident secondary schools; yet many of them did very well in the examinations, and 30 per cent graduated from the high school. In general, courses for adults out-of-school have been open to anyone who wants to try them. This custom is increasingly being extended to the academic-level courses, and is leading many schools and universities to review their requirements, and some of them to establish external degree programs by which credit can be earned by examination regardless of prerequisite study.

Evidence of effectiveness

As we have indicated, the data on learning and cost, even on audience, from these projects are scarce. Only a few of the projects have had the benefit either of adequately designed field research or attention by a trained economist. The presence or absence of some of the kinds of data we should like to see is indicated in Table 19.

Even this table, despite its many unfilled boxes, does more than justice to the data. For example, only three of the projects have measured learning with an experimental design; the others, if they collected evidence at all, have only the record of passes and failures in the course examinations.

But let us review what there is.

TABLE 19

Availability of Output Measures on Projects Designed to Extend the School

	Audience		Completion		
	Size	Composition	Rate	Learning	Costs
Austria	x	x	x	x	x
Australia	x	x			x
Germany, East					
Germany, West					
Funkkolleg	x	x	x	x	x
Telekolleg	x	x	x	x	x
France	x	x			
India (Delhi)	x	x		x	
Japan	x	x	x	x	x
Kenya	x			x	x
Mexico					
Radioprimaria				x	x*
Telesecundaria	x	x		x	x
Netherlands	x				
Poland		x		x	
Sweden	x	x			
Thailand	x				
U.S.A.					
Chicago	x	x	x	x	x
Purdue	x	x			
U.K.					
Open University	x	x	x	x	x

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*But not at this writing

How large are the audiences these programs serve?

The general adult education programs attract very large audiences. The four examples of these on which we have data are all in economically advanced countries; it is too bad we have no comparable evidence from a developing area.

When the East German Television Academy broadcast a series on mathematics for popular viewing, it received 200,000 letters from viewers. A series on "English for You" brought in 35,000, broadcasts on chemistry and physics drew about 100,000 each. A series of televised lessons in Russian drew 500,000 letters! (Paulu, 1969, pp. 66-67).

Audiences of the five most popular non-credit courses offered by France's RTS-Promotion were estimated by the Institut Français d'Opinion Publique as follows:

Series	Number of Viewers
Mathematics for all	1,000,000
Electronics	720,000
Labour legislation	670,000
Business management	560,000
Methods of mental work	530,000

(Garnier, in Internationales Zentralinstitut, 1971, p. 115)

A report on the Netherlands' Teleac listed both the active participants (meaning that they obtained the materials and supposedly worked along with the course) and the estimated number of viewers who were not active participants. These included:

Course	Active Participants	Other Viewers
Television for teaching and instruction		70,000
Mathematics: surfaces, contents, and tangents	5,014	80,000
Building and living	2,435	90.000
Astronomy	4,677	100,000
Studying		68,000
First aid in accidents	3,582	400,000
Further training for general medical practitioners	978	85,000

(Wermer, in Internationales Zentralinstitut, 1971, p. 151)

A report on TRU, Sweden's very broad program of televised education, provides some comparative figures over two terms:

Course	Mean number of viewers	
	1970, autumn	1971, spring
Psychology	235,000	136,000
The community of man	185,000	136,000
Let's do some more mathematics	225,000	361,000
It's for you	280,000	198,000
The labour market	70,000	68,000
Know your world	70,000	48,000
Information for adult students	265,000	136,000
Do you know? -- a televised dictionary	105,000	89,000

(Anderssohn and Bohlin, in Internationales Zentralinstitut, 1971, p. 182)

These figures are obviously projections from sample surveys, which are not described in the reports. They must be regarded as very rough estimates. However, they leave little doubt that a European country can attract a sizable proportion of its adult population to serious instructional television. It would be interesting to know what Brazil or Uganda or Korea, for example, could do with similar adult programs on their television or radio.

The school-extension projects that offer examinations and credit, and therefore are bound into formal schooling and curricula, attract smaller audiences than the general adult programs which place no requirements upon their viewers. Yet they are able to take care of large numbers of students, as the following summary shows:

Project	Registered students
Australia, radio-correspondence school (primary-secondary)	6,000 in New South Wales alone (Kummel, 1971, p. 27)
West Germany, Funkkolleg (radio course in pedagogy)	12,000 first term, 9,350 second (Hoffbauer, in Internationales Zentralinstitut, 1971, p. 93)
West German, Telekolleg (televised intermediate technical school)	Varies between 8,000 and 10,000 (Dordick, 1972, p. 18)
India, University of Delhi curriculum by correspondence with radio supplement	8,400 (Pant in UNESCO Regional Office, 1971, p. 22)
Japan, NHK Gakuen (radio-television-correspondence high school)	17,000 (Goto, 1972, p. 3)
Kenya (radio-correspondence in-service course for teachers)	1,900 in Form I, 2,000 in Form II in second year of project (Krival, et al., 1970, p. 26
Mexico, Telesecondaria (televised secondary school)	29,000 (Mayo, McAnany, Klees, 1972, chapter 4, p. 1)

Thailand Ramkhamhaeng University (closed-circuit)	43,000 (official report of the university)
Chicago TV College	6,900 (Schramm, 1970, p. 6)
Purdue (radio courses, for university credit)	Average of 2,000 a year (Forsythe, 1970, p. vi)
British Open University	34,000 in second year (official report)

These figures must be interpreted in light of related considerations. For one thing, very few of the projects represented in the listing just concluded are operating near their maximum capacity; if they were, considerable saving in unit costs would probably result. In the second place, some of those that are near capacity are hemmed in by facilities or other restrictions in a way that makes expansion difficult. For example, the India correspondence-plus-radio curriculum mentioned above now includes 45 per cent of all the B.A. candidates in the University of Delhi. The German Telekolleg now graduates more students than all the residence schools at its level in the entire state of Bavaria. Ramkhamhaeng University now fills its physical plant nearly to capacity, although some of the lecture halls it uses for students to receive the televised lectures hold 2,000 persons. Some of the Ramkhamhaeng classes enroll over 7,000 students! In the third place, most of the school-extension projects that include open-circuit broadcasts have a large unregistered and unenrolled audience listening or viewing over the shoulders of the students. We have already illustrated, in the case of the Netherlands' Teleac, the disparity between the total viewing audience and the portion of the audience that is serious enough to order the materials. In Chicago, the non-credit viewers vary from 10,000 to 40,000 per program, according to ARB measurements, as compared to perhaps 1,000 to 2,000 registered students. In West Germany, although the total enrollment of the Telekolleg is only 10,000, more than 10 per cent of all the television receivers in Bavaria are tuned in to the broadcasts of physics and history courses (Dordick, 1972, p. 23).

The over-the-shoulder audience is therefore a bonus for school-extension courses that have ostensibly been made for registered students. These audience figures say something about the appetite, at least in economically advanced countries, for continuing education.

Who are in the audience?

Whereas two-thirds of the registered students of the Chicago TV College are in their 20's and 30's, almost half of the non-credit viewers are in their 40's and 50's. Wherever such information is available for the school-extension projects, it backs up the Chicago finding. The younger people who need degrees or diplomas for their careers are likely to be the registered students, but the audience listening over the students' shoulders is likely to be older people who have missed some work when they were in school, want to refresh their knowledge of it, or are simply intellectually curious.

However, there is plentiful evidence that the school-extension programs including an open-circuit broadcast component also attract active registrants older than would be expected at a school in residence. That is, the programs offer a second chance to persons who are a bit beyond the school age. Consider, for example, the registration in the NHK Gakuen which offers a high school curriculum out of school, chiefly to working students. The Japanese youth would ordinarily enter high school at about the age of 17. But in the radio-television-correspondence Gakuen, only 38 per cent of the students are in their teens; 36 per cent are in their 20's, and 20 per cent are in their 30's (Goto, op. cit.).

The enrollment of the German Telekolleg is much the same. Only 44 per cent are 25 or under, 38 per cent are between 25 and 35, and 18 per cent are still older (Dordick, 1972, op. cit., p. 14). Fifty-six per cent of the students in the Polish Television Academy, which is supposed to prepare students for a technical school, are over 22 (Tymowsky, in Internationales Zentralinstitut, 1971, p. 162) A course in Austria, "Living Economics," drew half its audience from the 30-50 bracket.

Courses addressed to working people usually attract a disproportionate percentage of men. For example, the Austrian radio course (economics) drew an 86 per cent male enrollment; Germany's Telekolleg (technical preparation), 79 per cent male; Poland Television Academy (chiefly technical) 89 per cent male. On the other hand, Chicago TV College, which is intended mostly for home viewing, drew 75 per cent of its credit students from among women. They were home-bound with children, illness, or other responsibilities, and welcomed this chance to get in more college work, perhaps leading to a teaching job when they could finally get rid of some of the home responsibilities. Germany's Funkkolleg, when it offered a course in pedagogy, had 62 per cent female enrollment, most of them teachers or future teachers. The British Open University also had more female students than expected, perhaps because 34 per cent of its first class were teachers.

With the exception of the Australia and New Zealand radio-correspondence programs, which are for school-age children, the Delhi project which is for college students and the Ramkhamhaeng University in Bangkok which is, for all practical purposes, a campus university doing most of its teaching by television, these extension projects have proved extremely attractive to working and home-bound adults. Over 80 per cent of the credit audiences of the Austrian, the German, the Japanese, and the British programs, among others, come from people working at full-time jobs. The Japanese radio-television-correspondence high school has detailed figures on employment. Thirty-three per cent of its students work in factories, 12 per cent are nurses, 18 per cent in business, 8 per cent in some kind of office work. The Japanese surveys show, however, that the school is increasingly being used by adult women who married or were otherwise distracted from high school, and are now trying to pick up the courses they need for graduation. For them it truly represents a "second chance."

One other pattern of audience composition is worth noting. In the first class of the British Open University, as we have said, almost 90 per cent of the students did not have the A-level qualifications that would have been required of them for entrance into a campus university in Britain. Still, 16,000 out of 19,000 passed the rigorous examinations at the end of the year. What Britain has thus proved in a very impressive way is what other projects also have been discovering: that given a chance to compete, many people who do not have the required academic prerequisites, and who in many cases are beyond the usual ages of education, can still do very well in difficult studies. They usually are highly motivated and have been going for school to life, which has taught them many lessons which other people may or may not have learned in the classroom.

How many out-of-school students complete the course?

One of the problems with asking students to study by themselves outside a school is that there is invariably a considerable shrinkage in numbers between registration and completion. Many commercial correspondence schools, for example, are believed to have completion rates no higher than 10 per cent.

From the data at hand it is possible to estimate the degree of shrinkage in the kinds of out-of-school education we are examining in this chapter, which typically combine broadcasts with correspondence study and/or other activities. The rate varies by the type of course, and particularly by the amount of control and support given the student. For example, about 75 per cent of the students formally registered in the Chicago TV College complete the particular course for which they have registered (McCombs, in UNESCO, 1967, vol. 2, p. 114). These home students are highly motivated to earn college credit. About 84 per cent of the students who finally registered in the first year class of the British Open University completed their courses and passed the examination (Hawkridge, 1972). These students had the benefit not only of correspondence and self-study exercises, but also radio and television, and tutorial centers nearby when needed. (About half of them made some use of the tutorial centers.)

The Austrian radio course on "Living Economics" was less tightly structured than the two courses just mentioned. There was no formal registration requirement, but certain steps along the road to the examination measured the seriousness of the students. Thus:

> 6,400 students enrolled "on their own" (meaning not in factory classes). Of these,
>
> -- 5,069 (80 per cent) ordered the scripts at 25 schillings (about $1.00)
>
> -- 1,729 (28 per cent) ordered the textbooks at 169 schillings (about $6.50)
>
> -- Of the students who, when enrolling, said they wanted to take the exam, 52 per cent (1,338) still said they wanted to take it after 18 of the 32 weeks of the course
>
> -- 579 students (8 per cent of the original enrollees, 23 per cent of those who said they wanted to take the examination) actually *did* take the test.
>
> (Wagner, in *Internationales Zentralinstitut*, 1971, pp. 33-36)

Another course which was loosely structured and gave no credit toward a degree was the German Funkkolleg course in pedagogy. Here is the record of shrinkage in the active class members through two terms:

	First term	Second term
Originally enrolled	13,495	
Ordered the printed material -- 8 study letters at DM 24 (about $6.00)	12,100	9,350
Did the required homework and thus were eligible to take the final examination	5,997	4,048
Actually took examinations	3,825 (67% of those eligible, 28% of original enrollees)	3,563 (88% of those eligible, 26% of original first term registrants)

(Hoffbauer, in Internationales Zentralinstitut, 1971, p. 103)

It seems, from this last record, that once an out-of-school program has shaken its audience down to the members with serious intentions to complete the work, the shrinkage thereafter is relatively small.

So far we have dealt only with single courses. What is the rate of shrinkage in a whole curriculum offered outside school -- for example, a high school? We have evidence on this question from two sources: the German Telekolleg, which offers a two-and-one-half year technical school curriculum, and the Japanese NHK Gakuen, which is a four-year high school curriculum. The final completion rate in both of these seems to be in the neighborhood of 30 per cent. Here are the available figures on the first two classes enrolled in the Telekolleg:

	First class	Second class
Took exam at end of first 10-month term	41% (of original enrollees)	36%
Took exam at end of second 10-month term	31%	30%
Took exam at end of final 6-month term	27%	(not yet available)

(Dordick, 1972, p. 20)

And here are comparable figures from the first six classes of the NHK Gakuen:

Of	who entered in	after	this proportion had graduated
11,721	1963	9 years	25.3%
6,673	1964	8 years	30.5%
5,779	1965	7 years	30.2%
5,327	1966	6 years	27.5%
6,188	1967	5 years	26.1%
6,162	1968	4 years	20.5%

(NHK Gakuen, compiled by Goto, 1972, p.1)

It is reasonable to suppose that the first class of the school was somewhat atypical: students entered without really knowing what to expect or what was expected of them. Therefore, a slightly lower completion score is understandable. The 1964 class should have graduated at the end of 1967. Laggards by 1972 had another four years to finish their work, and by that time 30.5 per cent had graduated. The 1968 class, which should have completed its work by the end of 1971, had by that time graduated 20.5 per cent. We can assume, then, that in a situation like that of the NHK Gakuen, which serves students who are working full-time while they complete three years of high school in four, a little over 20 per cent will finish their course work and graduate on time, and that over the next four years another 10 per cent will graduate. Both from the Japanese and the German case, then, it can be assumed that a little less than one-third of out-of-school students in a demanding curriculum parallel in every way to a school in residence will ultimately complete their work and graduate.

How much do they learn?

From only three of the school-extension projects at this writing do we have evidence derived from an experimental design on how the students learned. These are the Mexican Telesecundaria and Radioprimaria and the Chicago TV College.

However, this is not the extent of the evidence. From a number of different projects we have data on the proportion of students who passed the final examination. And in addition to those,we have the record of a project like the Australian radio-correspondence schools which, for 40 years, have been graduating hundreds or thousands of students each year from primary and secondary school curricula, from which a considerable proportion have transferred to boarding schools or entered a university. Even though learning scores are lacking, one can hardly say that a project like that has not been successful in teaching students.

All three of the experimental comparisons were carefully done, but suffered from the common inability of field researchers to assign subjects randomly among treatments. For example, it was impossible for the Chicago researchers, if they sought a realistic situation, to assign certain students to study at home and others to study in the classroom. Those who actually registered for the course at home could not have taken it in the classroom; those who took the course in the classroom would have been unwilling to take it at home. Those who did take it at home had a special reason for doing so, and their gratitude for being able to do so was a significant element in the experiment. Similarly, the researchers in Mexico could not have assigned students randomly from the population to either experimental or control groups. No high schools were available for the Telesecundaria students to attend unless they moved to another town. Attempts were made, in these experiments, to equate the experimental and control groups or to allow for measured differences by means of covariance, but still the conditions of a completely rigorous experiment were not attained.

In Chicago, students who registered for a TV College course at home were compared with groups of day students and groups of evening students taking the same course, face-to-face, on campus. Altogether, 27 experimental comparisons were made, over three years, between face-to-face and home television students. Twelve of these were significantly different, 10 of them in favor of the home television group. Here are the results in more detail:

TABLE 20

Chicago TV College Learning Comparisons

First year

Subject	Method	N	Criterion	Score	Statistics	Significance
English 101	Home TV	354	Final exam	75.41	Covariance	n.s.d.
	Class	101		71.13		
Social Science 101	Home TV	90	Final and midterm	158.45	Matched pairs	n.s.d.
	Class	90		153.33		
Biology 101	Home TV	259	Final exam	110.31	Analysis of variance	Favors home TV, .05
	Class	98		101.01		
Political Science	Home TV	244	Final exam	108.69	Analysis of variance	n.s.d.
	Class	58		107.41		
English 101	Home TV	33	Final exam	23.85	Matched pairs	n.s.d.
	Evening class	33		23.79		
English 102	Home TV	69	Final exam	21.75	Analysis of variance	n.s.d.
	Class	24		21.95		
Social Science 102	Home TV	45	Final exam	74.64	Matched pairs	n.s.d.
	Class	45		73.89		
Biology 102	Home TV	153	Final exam	110.16	Analysis of variance	Favors home TV, .05
	Class	153		106.30		
Mathematics	Home TV	28	Course grade	2.97	Covariance	n.s.d.
	Class	28		3.17		

(Table 20, continued)

Second year

Subject	Method	N	Criterion	Score	Statistics	Significance
Accounting 101	Home TV Class	53 44	Final and midterm	79.38 76.05	Covariance	n.s.d.
English 101-102	Home TV Class	53 40	Not available	Not available	Covariance	n..s.d
Humanities 201-202	Home TV Class	69 73	Final and other tests	379.16 345.73	Covariance	Favors home TV, .05
Social Science 101	Home TV Class	56 23	Critical thinking post-test	29.0 26.47	Covariance	n.s.d.
Biology 101	Home TV Class	26 26	Final and other tests	n.a.	Covariance	n.s.d.
Biology 102	Home TV Class	153 153	Final and other tests	n.a.	Covariance	Favors home TV, .05
Child Psychology	Home TV Class	46 46	Final	74.46 69.89	t. test	n.s.d.
Shorthand	Home TV Class	26 64	Final	109.22 104.64	n.a.	n.s.d.

Third year

Subject	Method	N	Criterion	Score	Statistics	Significance
Social Science 102	Home TV Class	29 29	Course exams	129.13 121.0	Covariance	Favors Home TV, .01
Physical Science 101	Home TV Class	n.a.	Exams	212.41 230.85	Covariance	Favors Class, .01
Physical Science 101	Home TV Class		Exams	212.41 185.29	Covariance	Favors Home TV, .01
Humanities 201	Home TV Class	31 44	Course exams	176.16 181.11	Covariance	n.s.d.
Humanities 202	Home TV Class	20 31	Exams	152.01 176.10	Covariance	Favors Class, .01

(Table 20, continued)

Subject	Method	N	Criterion	Score	Statistics	Significance
Psychology	Home TV	60	Exams	187.27	Covariance	n.s.d.
	Class	30		178.83		
Psychology	Home TV	60	Exams	187.27	Covariance	Favors Home TV, .01
	Class	21		164.48		
Mathematics	Home TV	35	Exams	140.23	t. test	Favors Home TV, .01
	Class	30		122.76		
Speech	Home TV	17	Exams	118.34	Covariance	Favors Home TV, .01
	Class	48		106.19		
Speech	Home TV	17	Exams	118.34		Favors Home TV, .01
	Class	37		106.19		

(Erickson and Chausow, 1960)

The researchers who studied the Mexican Telesecundaria compared samples of schools (not students) in each of four districts of Mexico from among the schools teaching face-to-face and from the Telesecundaria groups taught with the aid of television. They used before and after tests, and obtained these results:

TABLE 21

Mexican Telesecundaria Learning Comparisons, 1972

	Telesecundaria			Direct Teaching		
Subject	Means	Gain	N	Means	Gain	N
Mathematics						
February	20.24			20.15		
June	25.92	5.68	1151	22.76	2.61	836
Spanish						
February	26.39			24.54		
June	31.50	5.11	1110	27.19	2.65	781
Chemistry						
February	18.06			18.49		
June	24.31	6.25	1132	22.70	4.21	713

(Mayo, McAnany, and Klees, 1972)

Because of the difficulties with design, the researchers declined to claim statistical significance for these results, and pointed out merely that the Telesecundaria students were obviously doing at least as well as comparable classes in the schools.

Table 22 presents similar comparisons for the Mexican Radioprimaria. This is an ingenious use of radio to expand three-year primary schools to six grades without adding three additional teachers. Sometimes the fourth, fifth, and sixth grades are taught by one teacher in the same room, and in a few instances the third, fourth, fifth and sixth grades are all taught together by one teacher. The most common pattern, however, is to put the fifth and sixth grades together under one teacher, sometimes combining the third and fourth grades, sometimes not. In any case, the radio broadcasts are used to help teach the three upper grades, with fewer teachers.

All the sixth grades in the Radioprimaria were compared with the sixth grades not taught by radio in the province of San Luis Potosí. Since the Radioprimaria schools were all in villages or small towns, suburban and city schools were eliminated from the non-radio sample. This resulted in the following results for tests given at the beginning and end of the autumn 1972 term:

TABLE 22

Mexican Radioprimaria Learning Comparisons, 6th Grade, 1972

	Radioprimaria (N=696)			Direct Teaching (N=316)		
	Mean	S.D.	Gain	Mean	S.D.	Gain
Mathematics						
September	15.7	6.3		17.5	6.8	
December	19.0	6.6	3.3	20.3	6.9	2.8
Spanish						
September	26.4	9.5		28.3	9.0	
December	30.1	8.9	3.7	30.1	9.1	1.8

(Spain, 1973, p. 17)

These gains were significant, but the author of the study preferred not to make any claim of statistical significance, in view of the conditions of field experimentation, but only to point out that the Radioprimaria students appeared to be gaining at least as much as the students taught in the usual fashion, without radio, one teacher to a classroom.

What if the suburban schools were not removed from the sample? This comparison was made also. The non-radio group gained no more than without the suburban schools (and less than the Radioprimaria group) but their beginning scores were higher. What if only the Radioprimaria schools that newly added sixth grades in the year of the test were included? That comparison also was made. The scores of the new radio schools were insignificantly different from those of the older schools.

Thus, it is reasonable to assume that the sixth grade students in the Radioprimaria are not learning any less than their peers in the ordinary classrooms.

The remaining quantitative data on learning are mostly records of the proportion of students who passed course examinations. This says nothing about how much was learned in comparison to how much might have been learned from another method of teaching. Rather, it measures what proportion of the registered students were learning what they were expected to learn from the course. Thus, for example, among the Austrian students who took the exam in the course on "Living Economics," only one per cent failed, which must have been encouraging to the teachers although they would have recalled that only about 20 per cent of those who originally said they intended to take the examination did so. (Wagner, op. cit., p. 36)

In general, all the examination figures on school-extension courses are encouraging. In the case of the German Telekolleg, only 60 of the 7,214 students who took final examinations in the first enrolled class failed to pass. This is less than one per cent. When this first class came to the end of its three-year curriculum, 97 per cent of the students who sat for the final examination passed. The average grades were slightly better than were made by students in the Berufsaufbauschulen, which teach the same curriculum in classrooms. (Dordick, op. cit., pp. 16 ff.)

In the University of Delhi correspondence curriculum (now supplemented by radio and other learning aids), the passing rate for the final B.A. varied between 42 and 50 per cent, which is just under the passing rate of all students in the University. (Pant, op. cit., p. 22)

In the radio-correspondence course (secondary education) for teachers inservice in Kenya, the passing rates compare favorably with those of residence students, both in public and in private schools. The average passing rate in public secondary schools is just under 25 per cent. For all private secondary schools, the rate is just under 12 per cent. But when the radio-correspondence students are separated out from these large groups, their record is quite different. Students in that course who took exams in six or seven subjects had a passing rate of 34 per cent; those who took only four or five exams had a rate of 44 per cent; and those who took only two or three subjects had 60 per cent passes. Furthermore, it is possible to compare the records of the students in different courses -- subjects they had studied in the radio-correspondence course vs. subjects they had studied otherwise. In all subjects studied by radio and correspondence, the average passing rate was 49 per cent. In all subjects not studied by radio and correspondence, for the same students, the passing rate was 20 per cent. (Krival, op. cit., p. 59 ff.)

A similar comparison can be made in the case of the Polish Television Academy. This institution, as will be recalled, is intended to supplement studies already offered in correspondence and face-to-face evening schools. A field survey identified students who viewed all or almost all the programs, and others who viewed only occasionally. This is what the records showed:

	Regular viewers	Occasional viewers
Did not take examination	30.6%	49.2%
Failed examination	10.2%	11.5%
Passed examination	45.1%	19.6%

(Swierzbowska, in Tymowski, et. al., 1969, p. 45)

The remaining students (in the hundred per cent) said they had never intended to take the examination or intended to take it later, or made another explanation of that kind.

So far as this evidence is conclusive, therefore, it seems to show that students in one of the systems designed to extend the school learn on the average at least as well as students in comparable classroom systems. This seems to be the case whether the course is in an economically advanced country (e.g., West Germany) or a developing country (e.g., Kenya). It seems to be the case whether the broadcast medium is radio (Australia, Kenya) or television (Mexico, Germany) or both (Japan, Britain). And it seems to apply whether the course is at the level of primary or secondary (Mexico, Australia, Kenya, Japan) or technical school (Germany, Poland), or higher education (Britain, Chicago).

How much does this kind of teaching cost?

As we have said, only a few of these projects have been studied by professional economists. Two that have been so studied are the Mexican Telesecundaria and the British Open University. Let us look at those cost estimates first.

Telesecundaria

The Telesecundaria is intended to provide the standard secondary curriculum by television so that small towns that have no secondary schools can operate a secondary school in facilities provided by the town and with fewer and less specialized teachers than the ordinary secondary school requires. We have already seen that students in this kind of extended school appear to learn at least as much as students in the ordinary direct-teaching secondary schools. How do the costs compare?

Klees, an economist, examined these with some care, and arrived at the following cost estimates for the Telesecundaria and for direct teaching.

In the following table, 1,620 pesos per student are the relatively constant costs of adding a new student to the system. The remaining 264 pesos per student reflect the relatively fixed costs of television production and transmission which, on a per student basis, will increase or decrease in proportion to the number of students in the system. The total cost per student will thus come down as numbers are increased, approaching a minimum of 1,620 pesos per student. It should be noted, furthermore, that the cost

TABLE 23

Average Costs per Student in the Telesecundaria (in pesos)

Cost component	Basis for calculation	Annual cost per student
Classroom teachers	Average salary, 2,100 per month, estimated to teach 23 students	1,100
Administration	Total cost for 1972, 2.1 million, divided by 29,000 students	70
Television		
--production	Four studios, .4 million, with 20-year life assumed = .19 million Studio equipment except videotapes, 3.8 million with assumed 10-year life = .62 million Videotapes = .65 million Maintenance = 1.5 million Production personnel and expense = 2.75 million Teleteachers = 1.3 million	
--transmission	Estimated for a station of size and power of station now used free = .65 million	
Total, television = 7.66 million, divided by 29,000 students =		264
Classroom and maintenance	Estimated on cost of providing same size facilities as are now used, although most of them are now free of charge; 20-year life assumed	140
Television receiver and maintenance	3,500 per receiver, 5-year life, 10% maintenance	60
Cost to student	Books and supplies = 200₱; uniform = 50₱	250
TOTAL		1,884 ₱ (about $151)

(Source: Klees, 1972)

estimate includes some items that the Telesecundaria does not have to pay. For example, television transmission is now furnished free of cost, as are the majority of the facilities used for classrooms. The Telesecundaria therefore actually costs, at the moment, a little less than these estimates indicate.

Comparing the cost of Telesecundaria with that of direct teaching in the public schools, Klees arrived at this estimate:

TABLE 24

Average Cost per Student in Regular Schools in Mexico
(in pesos)

Cost component	Basis for calculation	Annual cost per student
Teachers	Full-time teacher equivalent works 39 hours per week at monthly rate of 125 ₱ per hour, over 12 months, with average class size of 50	1,170
Administration		630
Facility	Fully-equipped classroom estimated at 236,000 ₱, lasting 25 years, used by average of 1.5 classes, average class size: 50	346
Cost to student	Books and supplies = 300 ₱; uniform = 50 ₱	350
	TOTAL	2,496 ₱ (about $200)

(Source: Klees, 1972)

With direct teaching there are no overall fixed components that give decreasing per student costs as more students are added to the system. The cost of adding students to the two systems would thus be about $200 for the direct teaching versus $129 for the Telesecundaria.

Klees has also estimated what it would cost to do, by means of the existing pattern of direct teaching, the job Telesecundaria is now asked to do. If present class sizes (50 students per class in the direct teaching system) were maintained, it would cost around $236 per student, under the most favorable circumstances. However, if administration and facility construction costs follow the past patterns for direct teaching in the Telesecundaria, then the cost would be about $431 per student.

An enrollment of about 10,000 students seems to be the break-even point at which the unit costs of Telesecundaria become more favorable than those of direct teaching. Below that level, the fixed costs of television make the Telesecundaria cost more than direct teaching. Above that point, the cost advantage of extending the school by means of television steadily increases.

The Open University

A full-length economic study of the British Open University has not been published, although the operation is being studied and careful reports will be in print within a year or two. We have two sources of data: an informal estimate made by us on the basis of published figures, and an unpublished study by an economist which we are not privileged as yet to quote in detail.

Our estimate is that at its present level of enrollment (34,000), the Open University costs about $1,200 per student per year. This compares with a cost in the neighborhood of $2,000 to $2,400 per student in a campus university in Britain. These figures have been checked with officials of the Open University, who agree that they are reasonable estimates but feel that it is too early yet in the life of the University to say what its costs are likely to be when it has a full enrollment and settles into a pattern of operation.

However, our estimate is very close to that of the economic study just mentioned, which has examined costs in detail for the first year of operation. The author has compared the cost per student of the Open University with the cost for certain other universities in Britain that, like the Open University, do not have large graduate or professional schools (for example, Exeter) and with certain other universities (like Cambridge, for example) that do have such expensive schools. He arrives at this comparison:

For the Open University	£ 489	($1,173)
For campus universities without professional schools	£ 694	($1,666)
For campus universities with professional schools	£ 833	($1,992)

He believes that the unit costs of the campus universities would not decrease notably with increased enrollments, whereas the Open University would decrease its unit costs through being able to write off its television, radio, and certain other extension costs over 50,000 students rather than 20,000. As the Open University enrollment climbs into the 30,000 range, he expects costs to fall under $1,000 per student.

Australia

The most recent cost estimate we have for the Radio-Correspondence Schools of Australia date from 1966 (Kinane, in UNESCO, 1967, vol. 1, pp. 169 ff.). Kimmel made a case study of the Australian operation in 1971 and reported merely that the 1966 estimates still apply.

At the time the cost figures were provided, costs per student of radio-correspondence were estimated at $310, plus the charge to the student for summer camp ($27) if he cares to go. Tuition, books, materials, and postage are all free to the student and covered by the estimate of central expense, except in secondary school where a government allowance usually does not cover the entire cost of textbooks. This estimate is for New South Wales, where approximately 7,000 students were enrolled. In the state of Victoria, where enrollments are less than 1,000, the total cost per student was estimated at $611. The unit costs are therefore highly sensitive to enrollments.

The New South Wales cost of $310 corresponds to an average of $265 per student for classroom education. The break-even point, at which radio-correspondence education would cost less than classroom education, is hard to calculate from available data but should be attained before enrollment reaches 10,000.

The figures we have given are for the radio-correspondence study alone. Schools of the Air, where enrollments have to be considered in class units and necessarily kept small so that all the students can make use of the two-way radio (which also costs additional money), are more expensive. The costs will also depend somewhat on the basic costs of correspondence and radio in the state where the School of the Air is organized. The 1966 study estimates were that a School of the Air, enrolling 100 pupils, would cost an additional $84 per student for capital and operation expenses, over and beyond the basic cost of radio-correspondence education. In other words, a school of 100 enrollment, with teachers and pupils talking directly to each other by radio, was estimated to cost just under $400 per student. If the class were only 60, the cost would be about $450 per student per year.

The real question of costs, however, is what it would cost to do the same job in another way. It would be infeasible to build schools in the great open spaces of the Australian "outback." The only alternative is boarding schools. They cost $600 to $1,200 per student per year. This is the choice open to parents who settle their families in the great open spaces of central Australia, and in that circumstance the radio-correspondence alternative seems very reasonable.

The Telekolleg

Dordick (1972) has made an estimate of the annual cost per student of the German Telekolleg, using official figures from that institution and the Bavarian government. He calculates that the average cost per successful student is about DM 433, or roughly $122, per year. Note that this is the unit cost for a student who graduates. The annual cost of an enrolled student, who may or may not be intending to take examinations and seek credit, and if he does take the examination may or may not pass, is less than one-third that much. Actual cost to the student is estimated at DM 24 ($6.90) per 13-week term, or about $21 a year. Therefore, the entire cost, so far as it can be estimated from available data, is about $143 per successful student for a year of education in the Telekolleg.

How does this compare with the cost of classroom schooling? The Ministry of Education in Bavaria gives these estimates for the unit costs of different levels of schooling:

Volkschule	DM 1,070	($301)
Realschule	DM 2,240	($631)
Gymnasium	DM 2,280	($642)

The precise parallel to the Telekolleg, the Berufsaufbauschule, is so new that reliable costs are not yet available. The Ministry estimates that its cost lies between that of the Volkschule and the Realschule, perhaps in the neighborhood of $400 to $500 a year. When we note that the Telekolleg students do at least as well in final examinations as do the students in residence, and that the Telekolleg graduates more students than all the Berufsaufbauschulen in Bavaria, then these costs make it seem quite a bargain.

The NHK Gakuen

Amagi, an economist of the Japanese government, made an estimate of unit costs of the NHK radio-television-correspondence high school in 1966 (UNESCO, 1967, vol. 1, p. 149 ff.), although he was apparently unable to include all cost elements. We have updated and considerably raised his estimates with the help of the Radio and Television Culture Research Institute of NHK.

The main cost inputs to the Gakuen in 1971 were these:

NHK contribution to the correspondence school (for preparation of texts, study materials, grading of correspondence lessons, study days, etc.)	$1,350,000
Student fees to correspondence school	330,000
NHK expenses for producing and transmitting	
Television lessons	1,997,000
Radio lessons	434,000
TOTAL	$4,111,000

In 1971, the NHK Gakuen enrolled 17,789 students. This would make the cost per student about $231. For comparative purposes, however, it is necessary to multiply this by 4/3, because four years in the Gakuen (where students are working full time, in addition to studying) equals three years in an ordinary high school. Therefore, we can estimate that a year of high school in the NHK Gakuen costs about $308 per student. This is very reasonable in comparison to the cost of high school education in Japan, which in the last year for which such estimates are available was about $540.

However, the number of graduates from the radio-television-correspondence curriculum is rather small. During the last three years it has averaged about $1,918 per year. This would make the cost per year per graduate about $2,143.

These are approximate figures only, but they make it clear that the NHK Gakuen is relatively inexpensive per student, relatively quite expensive per graduate.

The Kenya Teachers Program

Approximate costs can be figured also for the Kenya radio-correspondence course of secondary education for teachers. The input to this project, over a start-up year and two years of operation, was:

Contribution from U.S.A.I.D., for preparing courses, training staff, and operations	$479,964
Contribution of a building from Denmark, amortized over 25 years	38,930
Contribution of Government of Kenya, for operations	410,556
Government of Kenya charges to students and payments to some employees	73,412
Notional interest	120,000
TOTAL	$1,122,862

During this time there were 27,467 separate course enrollments. Assuming that three courses would constitute a full-time year of study, we can estimate the full-time equivalent enrollment at 9,156. If this is correct, then the cost per full-time student per year was just under $123. This may be too high, because the start-up costs have not been allowed for. Certainly a correspondence course made in the first year would last for five years. On that basis, the total per student cost is probably somewhere near $100 per year.

A comparable figure on the cost of residence secondary school in Kenya is not presently available. It is variously estimated from $200 to $400.

Cost of Broadcast Production

Some of these studies provide an opportunity to estimate the production cost of the radio or television broadcasts used in the extension teaching. The first thing one notices about them is the great variation in cost from place to place. The British Open University pays BBC £8,000 (about $20,000) per hour of television time. On the other hand, Klees calculated that the Mexican Telesecundaria was producing television for about $470 an hour. Of course, these cost differences reflect not only difference in salary levels but also difference in standards and complexity of production. Even so, the disparity makes one suspicious of the cost elements included in the estimate.

Here is the sweep of hourly production costs of television, as derived from these studies on extending the school:

Mexican Telesecundaria (Mayo, McAnany, and Klees, 1972)	$470
Chicago TV College (McCombs, UNESCO, 1967) (This was an estimate for 1966. Rising costs alone would put it up to perhaps $800 today.)	$583
Netherlands Teleac (Wermer, in Internationales Zentralinstitut, 1971)	$1,055
NHK Gakuen (calculated from NHK Research Institute figures, 1972)	$1,973
German Telekolleg (from Dordick, 1972)	$8,700
British Open University (official figures on payment to BBC, 1971, 1972)	$20,000

One of the more interesting comparisons emerging from these studies is within the NHK data, which provides an opportunity to put side by side the production costs of radio and television programs, made by the same organization, at the same time, in the same circumstances, and for the same purpose. In 1971, NHK was apparently spending:

For an hour of television	$1,937
For an hour of radio	$356

In other words, an hour of television cost NHK 5.4 times as much as an hour of radio.

This ratio should be interesting to any developing country selecting its medium for school extension.

The Significance of This Chapter

The import of these pages is that here is one pattern of mediated education that really seems to work.

It works with either radio or television, or both. It works in developing countries or highly industrialized ones. It works at many different levels of education. Where data are available, they show that the students in one of these school extension programs learn at least as well as students in the same curriculum in the traditional classroom. The extension education usually costs less than classroom education, and offers educational opportunities, in places where they are not otherwise available, at considerably less than it would cost to offer the same opportunities in the same places by building, staffing, and operating traditional schools.

So far as the choice of media is concerned, there seems surprisingly little to choose between radio and television. It cannot be said that television is the medium for economically advanced countries, and radio for developing countries. On the contrary, radio seems to work well in Australia and Germany, which are far from primitive, and television has demonstrated that it can work well in Mexico and was the choice of Thailand when that country wanted to extend university opportunities to a vast number of students. Other things being equal, a planner would probably choose television over radio for this purpose because it would allow him to present visual materials when necessary along with sound. But things are not always equal; we have noted, for example, that Japan spends more than five times as much to produce an hour of television as to produce a comparable hour of radio. Japan can afford it. Some other countries might prefer to deliver the visual experiences another way and make maximum use of the capabilities of radio at one-fifth the cost.

An interesting trend that appears in these data is worth mentioning again: the tendency of school-extension systems to grow into multi-media teaching. The British Open University, Sweden, and certain other affluent countries rich in audiovisual equipment and talent would be expected to do this, but the trend is far broader. Even the University of Delhi, which started to use correspondence study to relieve the demands it could not meet for entrance to its undergraduate programs, soon decided to add radio programs to its instruction, and has now made some use of television also. None of these programs has found it satisfactory to use only radio or television; all of them have had to provide at least study materials and some two-way communication with a teacher -- occasional classes, correspondence papers, study groups, or even, as Australia does, classes held over two-way radio. In other words, although this pattern of instruction places more responsibility on the student and enables him to work by himself and in places where there are no schools, it tends to develop in such a way as to provide as many as possible of the learning experiences of a classroom. The data on learning indicate that it often accomplishes this very well.

VII

MEDIA FOR OTHER FORMAL EDUCATION

Many uses of instructional media in formal education have not been covered in Chapters V and VI. They are the subject matter of this chapter.

For example, nothing was said in those chapters about the use of the media for "enrichment," by which we usually mean some experience, difficult or impossible to provide in the classroom, that is intended to add variety, enjoyment, or a new insight to the course; or "supplementary use," by which we usually mean some experience not directly on the syllabus that will lead the student beyond what he would ordinarily be able to learn in the classroom. Neither of these uses is part of the core of the course; consequently, they may be made use of or not, at the volition of the classroom teacher. But some of the uses we shall be talking about in this chapter are core teaching. For example, a film on Ohm's Law may be the best way to teach that essential segment of electronics. Hagerstown used television to teach the core of music courses, when specialized music teachers were scarce. Sudan has used both television and radio to teach English language courses. And this kind of core teaching does not have to be small in size. Colombia uses television to upgrade instruction for nearly half a million children; Thailand uses radio to help teach more than a million.

The essential difference between such large projects as those we have just mentioned and the large projects described in the two preceding chapters is that, whereas the educational reform and school extension projects were aimed at major institutional changes, projects in this chapter are directed simply toward the improvement of instruction.

Most of the uses of instructional media in the world are of this latter kind. Therefore, we are dealing in this chapter with a vast and amorphous area of media use which we can only represent rather than cover.

Nature of the evidence

Most of the evidence we cited in Chapter III, on learning from instructional media, was derived from "enrichment" or "supplementary" or minor "core" uses of the media. Those studies showed clearly that a student usually learns a great deal from media teaching of acceptable quality, that he learns from any and all media, and that when the experimental conditions are controlled he usually learns at least as much from the media as from the face-to-face teaching in the classroom. This seems to hold for a single exposure to instructional media, a few exposures, or a whole term of teaching. The evidence cited in Chapter III is quite convincing, and there is no reason for us to reproduce or extend it here. Let us simply record that students appear to learn effectively from instructional media when those are used competently, and then turn to other matters.

Unfortunately, the studies are unevenly distributed -- over media and over geography. The bulk of the studies are on television and films. Radio has been studied very little in proportion to its usefulness in the developing areas. In the late 1950's and early 1960's there was a rash of studies on programmed instruction, and recently there have been a few on computer-assisted instruction. Language laboratories have had a few studies. Almost no one has studied the least complex and expensive media -- filmstrips, printed graphics, models from natural environment, the use of chalkboards, and so forth.

Furthermore, most of the studies cited in Chapter III were conducted in North America or Europe. There are very few from developing areas.

Finally, few of the learning studies cited in Chapter III have been accompanied by economic analysis. We have mentioned some of them, such as the ability of Penn State to break even on closed-circuit television of classes with as few as 250 students. The generalized estimates of cost in Chapter IV will be more useful than the few figures cited in connection with learning studies. One of the really useful activities in this field, particularly for new and developing countries and their school systems, would be an economic analysis of these smaller and less expensive media, to which a study of that taken-for-granted medium, the textbook, could well be added. It is important information for developing countries that film-loops in a cassette can be made for as little as $5 or purchased for perhaps one-tenth the usual cost of an instructional film. The combination of filmstrips with radio or with a script for the teacher is a highly promising and apparently cost-effective technique which has hardly been studied systematically. The availability of low-cost cassette tape recorders adds to the potential of teaching by sound, and particularly encourages student practice with a language model, and student individual study. Research has tended, understandably, to concentrate on the more spectacular and more expensive media, while neglecting the less glamorous ones.

It is not possible in this chapter, of course, to review non-existent studies of little media. It is not necessary to repeat the learning data in Chapter III nor the cost data in Chapter IV. However, we can fill in the evidence to some extent by citing a few examples and field studies from developing regions of the world.

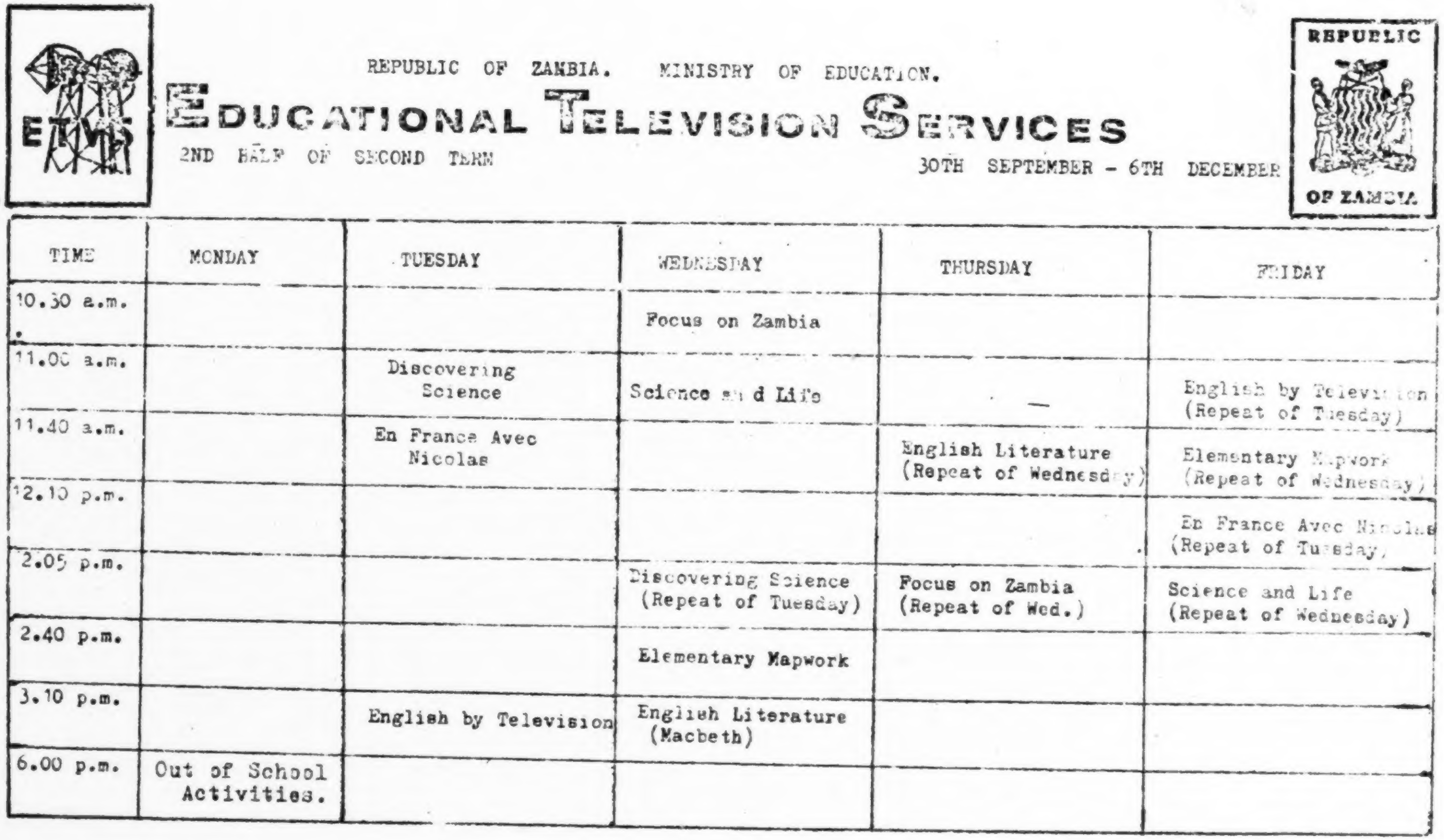
How radio and television are used in an ongoing program

In the two preceding chapters we have described the television and radio schedules and programs that are aimed toward abruptly changing a school system or creating a new system. Let us now look at a system that is aiming at no such institutional change, and see what use it makes of the broadcast media for instruction.

The Republic of Zambia makes neither the largest nor the smallest use of instructional media among nations outside North America and Europe. The resources it can put into media are above average for developing countries because of its income from mineral deposits. Consequently, its instructional media program is much more extensive, say, than that of Sudan, which, after four years, had only one television program (teaching English to secondary schools) and a radio program that adapted the television script for schools outside TV coverage (Plowright, 1968). On the other hand, it is very small in comparison to the instructional broadcasting of NHK in Japan, which sends out every week over 33 hours of school television, over 30 hours of school radio -- each including more than 100 programs from kindergarten through high school -- in addition to a complete secondary school curriculum for correspondence students, four hours a week of radio and nine hours a week of television, including repeats, of adult lectures for a "Citizen's University," and four trial courses looking toward a "University of the Air." Over 80 per cent of all the kindergartens and primary schools that can receive radio and television use these ITV and IR programs, as do over 30 per cent of the junior and senior high schools. The total is millions of pupil hours per week. If Zambia's effort seems small beside that, so do the efforts of most economically advanced countries.

Zambia television broadcasts a little over seven hours a week of instructional programs, seven subjects with one repeat each, plus one program a week on "out-of-school activities." These are generally pitched at the secondary level, but also appear to be intended for home and adult viewing. (See Figure 15)

Zambia radio, as can be seen from Figure 16, broadcasts two hours and 45 minutes of instructional programming each day, 11 15-minute programs, adding up to 13 hours 45 minutes per week. These programs



REPUBLIC OF ZAMBIA. MINISTRY OF EDUCATION.

EDUCATIONAL TELEVISION SERVICES

2ND HALF OF SECOND TERM

30TH SEPTEMBER - 6TH DECEMBER

REPUBLIC OF ZAMBIA

TIME	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
10.30 a.m.			Focus on Zambia		
11.00 a.m.		Discovering Science	Science and Life	—	English by Television (Repeat of Tuesday)
11.40 a.m.		En France Avec Nicolas		English Literature (Repeat of Wednesday)	Elementary Mapwork (Repeat of Wednesday)
12.10 p.m.					En France Avec Nicolas (Repeat of Tuesday)
2.05 p.m.			Discovering Science (Repeat of Tuesday)	Focus on Zambia (Repeat of Wed.)	Science and Life (Repeat of Wednesday)
2.40 p.m.			Elementary Mapwork		
3.10 p.m.		English by Television	English Literature (Macbeth)		
6.00 p.m.	Out of School Activities.				

Figure 15.

REPUBLIC

OF ZAMBIA

MINISTRY OF EDUCATION

SCHOOLS BROADCASTS: TERM ONE, 1969

(Monday 27th January–Friday 21st March, 1969)

Time		*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*
10.30–10.35	Services Identification and Announcements					
10.35–10.50	PRIMARY	G 7 ENGLISH EXPRESSION	G 6 ENGLISH	G 5 SINGING	G 7 HISTORY (R)	G 7 ENGLISH (R)
10.50–11.05*	SECONDARY	F I CIVICS	F III FRENCH	F II HISTORY	F II FRENCH (R)	F I & 2 GEOGRAPHY (R)
11.05–11.20	PRIMARY	G 5 SCIENCE	G 7 SCIENCE	G 6 ENGLISH (M.A.I.) (R)	G 6 SCIENCE (R)	G 5 SOCIAL STUDIES (R)
11.20–11.30	5 minutes' Musical Interlude followed by News Headlines at 11.25					
11.30–11.45	SECONDARY	S. C. FORMS ORAL FRENCH	S. C. FORMS ENGLISH LANGUAGE	S. C. FORMS ENGLISH LITERATURE (R)	F III ENGLISH (R)	S. C. FORMS HISTORY (R)
11.45–12.00	PRIMARY	G 6 SOCIAL STUDIES	G 5 ENGLISH (J&S)	G 7 GEOGRAPHY (R)	G 5 ENGLISH (R)	G 7 CIVICS (R)
12.00–12.15	SECONDARY	F II ENGLISH	F I HISTORY	F II CIVICS	F I ENGLISH (R)	F III FRENCH (R)
	BREAK					
2.00–2.05	Services Identification and Announcements					
2.05–2.20	SECONDARY	F III ENGLISH	S. C. FORMS ENGLISH LITERATURE	F I & II GEOGRAPHY	S. C. FORMS ORAL FRENCH (R)	S. C. FORMS ENGLISH LANGUAGE (R)
2.20–2.35	PRIMARY	G 5 ENGLISH	G 7 ENGLISH	G 6 ENGLISH (R)	G 5 ENGLISH (J&S) (R)	G 7 ENGLISH EXPRESSION (R)
2.35–2.45	5 minutes' Musical Interlude followed by News Headlines at 2.40					
2.45–3.00	SECONDARY	F I ENGLISH	F II FRENCH	S. C. FORMS HISTORY	F II ENGLISH (R)	F II HISTORY (R)
3.00–3.15	PRIMARY	G 7 GEOGRAPHY	G 5 SOCIAL STUDIES	G 7 HISTORY	G 7 CIVICS	G 5 SINGING (R)
3.15–3.30	PRIMARY	G 6 ENGLISH (M.A.I.)	G 6 SCIENCE	G 5 SCIENCE (R)	G 7 SCIENCE (R)	G 6 SOCIAL STUDIES (R)
3.30	Handing over to Z.B.S.					

Figure 16.

go to the three upper primary grades (fifth, sixth, seventh) and all the forms of secondary school. They concentrate on English, Social Studies, History, Geography, and Science, with French added in the upper forms. There is one 15-minute program per week per course. This is clearly not enough to handle the core teaching (which, as we have seen, in Niger has five programs per course per week, in El Salvador three) and therefore we may assume that Zambia uses instructional broadcasts to enrich the class experience of its pupils. The number of different courses and different levels to which it contributes radio or television, however, indicates that it must have found this kind of assistance useful.

A study of ITV in an isolated village

We have no studies on the effectiveness or cost of Zambia school broadcasting, but do have several studies from Japan. It must not be assumed, even in view of the enormous size and extent of Japan's instructional services, that every Japanese school makes major use of media. It is a mountainous country with many small isolated villages, and radio and television have come slowly to many such schools. The Japanese Ministry of Education had been disturbed by the test scores of children in these isolated villages. These can be illustrated by a selection from the Ministry's 1959-1960 survey, which classified primary schools by their location and by their average scores on achievement tests:

Location	Scores in Japanese	Arithmetic	Soc. Studies	Science
National average	49.2	43.6	44.5	51.7
Residential district	58.4	52.1	52.2	55.8
Business district	57.2	50.0	53.6	56.5
Mining, industrial district	53.5	47.2	44.7	50.5
Agricultural district	43.3	38.6	39.7	50.2
Mountain villages	41.0	36.0	32.9	46.6
Out-of-the-way district	40.0	35.8	34.0	46.3

Translate some of these location names into urban, suburban, rural, northeastern, southern, and so forth, and such a distribution of scores would not be uncommon even for the United States. But the Japanese Ministry decided to test out the effect of instructional television on some of the lower scores, and for that purpose chose four mountainous villages only 75 miles from Tokyo but difficult to reach by surface transportation.

Fifth grades in two of these four schools were given television receivers, and agreed to make use of ITV in science and social studies. The other two schools were used as a control group. No teacher in the TV group had previous experience in teaching in a classroom with television. Pretests were given all the fifth grades in science, social studies, and intelligence. The Tanaka-B test was used for the latter measure and standardized tests for course achievement. No significant differences were found between TV and control groups on any of the pretests, although the control schools scored slightly higher in intelligence and the TV schools slightly higher in both subject areas. Pupils whose scores were subnormal were removed from the sample, and the result was a close match of mean scores for 130 TV children and 72 controls.

The TV classes received one science and one social studies program per week, each 20 minutes in length. At the end of the school year both experimental and control classes were tested again, with the results shown in Table 25.

TABLE 25

Scores after One Year, NHK Study of ITV in Isolated Villages

Subject	TV Group (N=130)		Control Group (N=72)
Intelligence	52.6		48.9
Standard deviation	9.64		13.0
t		2.07*	
Social Studies	45.9		43.1
Standard deviation	7.71		9.67
t		2.09*	
Science	47.9		42.3
Standard deviation	7.16		8.64
t		4.64**	

(Tsuji, 1964, p. 9)

---

* = 5% confidence level
** = 1% confidence level

Thus, at the end of the year the TV classes in all three measures had moved significantly ahead of the non-TV groups. The gains were impressive in science and intelligence, but disappointing in social studies, as we see from Table 26.

TABLE 26

Gain Scores in One Year,
NHK Study of ITV in Isolated Villages

Group and Subject	Scores Before	After	Difference
Intelligence			
Television	45.4	52.6	7.2**
Control	46.2	48.9	2.7**
Social Studies			
Television	44.9	45.9	1.0
Control	43.2	43.1	-0.1
Science			
Television	42.9	47.9	5.0**
Control	41.0	42.3	1.3

(Tsuji, 1964, pp. 10-11)

**= 1% level
others not significant

Thus, the increase of intelligence and science scores for the TV group were really quite impressive. The superiority of the TV group's gains in both intelligence and science were also significant at beyond the one per cent level. There were no significant differences at all in social studies.

In some ways the most interesting results of the study, however, came from analysis of the scores against ability. When the groups were dichotomized on the basis of scoring above or below 45.5 on the intelligence pretest (50 being the national mean), then it was seen that the lower intelligence group in the TV group in every case gained significantly more than the lower intelligence group among the controls. This difference was in all three tests significant at beyond the .01 level. When higher-intelligence groups were compared, however, the only significant difference was in science, where the TV group came out significantly higher. Thus, the ITV experience seemed to have greater effect on the lower-ability than the higher-ability students. The trend was strongly for students who scored low on the pretest to move closer to the class mean on the after-test. If this conclusion holds up in other non-American, non-European countries, it will be of great interest to developing countries that are trying to serve isolated communities and educationally disadvantaged children.

School television in India

India's first television station was in Delhi, and much of its transmission time in the first years was for schools. In 1964 and

1965, when 22,000 students in 227 schools near Delhi were studying science with the aid of television, Paul Neurath (who had previously evaluated the Poona radio rural forums) was called in to study the effectiveness of school broadcasts in physics and chemistry.

Dr. Neurath went about his task carefully and thoughtfully, trying to allow for obvious irregularities in the situation that kept the design from approaching the precision of an experiment in natural science. He gave four rounds of tests (one of which had to be thrown out because of incomplete collection). Each round was given to a different sample of 250-350 television students, 100 to 250 control students.

His main hypotheses had to do with the kinds of knowledge that would be better learned with television than without it. He divided the test questions into three types: factual -- things learned by heart from books or lectures; visual -- where the student draws primarily on experiments, diagrams, pictures he has seen; and understanding -- where the student has to draw on his ability to generalize, to make deductions, to recognize a problem or a connection even when it comes in a form unfamiliar to him. He hypothesized that television students would do better with visual questions, and about the same as the controls on factual questions; and left open the question of which group would do better with the "understanding" questions.

What did he find? Without citing figures, which become rather cumbersome because of his methods of tabulation, we can report that the television students did somewhat better over-all and on all types of questions. They did best -- comparatively -- on visual questions, and the difference was least on factual questions, thus being in general agreement with the hypotheses. The result that most surprised the experimenter was that television students did distinctly better on the understanding (problem-solving) questions.

He also gave one of the tests over again, after a month's interval. Again the television students did better on all three kinds of questions, but the difference between television and non-television students was less on the second test.

Dr. Neurath, therefore, gave a good report card to instructional television as teacher of physics and chemistry. Some of his conclusions about the impact of television on the Delhi schools are as interesting as his quantitative results:

Impact on teachers and teaching --

> -- "Whether he cheers or jeers at the television teacher, whether he finds him a better, an equal, or a worse teacher than himself, a friend, an aider, an intruder into his classroom -- the classroom teacher is forced so and so many times a week to become aware of another teacher's performance in front of his own students and thus to become aware of his performance as well.
>
> -- "the whole teaching process, though not necessarily the teaching performance of every single teacher, is slowly improving.
>
> -- "Science teachers are becoming aware (from seeing the television teacher) not only of the necessity but also of the possibility to mobilize their own, even though in most cases rather meager, laboratory resources ...more vociferous in their clamor for more laboratory space and equipment."

Impact on the student --

> -- "television lessons provide a break in the routine, thus making school itself more interesting."

Impact on the school system --

> -- "The impact of the television lessons themselves is less than the impact of television as an innovation within the whole teaching process.
>
> -- "Principals...come almost invariably to the same point: teachers have to adhere more closely to the syllabus. Before television they saw relatively little possibility to check up on whether their teachers were following the syllabus or not.
>
> -- "Syllabi are being revised."

(Quotations from Neurath, 1968, pp. 71-81)

School television in Colombia

In 1965 Lyle and others made a case study of Colombia school television during its second year. This study may be read in UNESCO, 1967, vol. 2, pp. 49-75. From our point of view, however, the most interesting features of the record on Colombia may be some learning studies made in the same year as the case study, by Maccoby and Comstock (1967), and an economic analysis by Torfs (1967).

At the time it was studied, the Colombia system was broadcasting 40 15-minute programs per week (10 of which were repeats) to the first five grades of primary school. It was also broadcasting some teacher inservice training. The audience was very large -- 275,000 in 1965, and over 400,000 presently. Thus it probably serves more students than any other ITV system in the developing regions.

In 1965 Comstock and Maccoby, who were in Colombia to study the problems and performance of the U. S. Peace Corps, tested a large group of primary school pupils who had been taught with the aid of television against a similar group who had been taught from the same syllabus but not by television. The study included about 5,000 students in the District of Bogota. Tests were based on the course syllabi.

Eight comparisons, in the second, third, fourth, and fifth grades, were possible. In three of the eight -- grade 2 language, grade 5 mathematics, and grade 4 science -- the means were significantly different in favor of the television classes. In the other five -- grades 3 and 5 science, grades 3, 4, and 5 social science -- there was no significant difference.

This was not a surprising result, but Comstock and Maccoby noticed something else they wanted to test. They found a great variety in the learning contexts being provided for television in the classroom. A few teachers actively rehearsed their students in the points made on television. A few others invited questions. More of them simply lectured on the same subject as the televised program. Still others did very little of anything related to the broadcast. So another experiment was designed. One group of teachers was assigned to direct a purposeful question-and-answer session based on the television program during the remaining minutes of the period. Another group was assigned to lecture on the main points made in the broadcast. Still another group did what they had always been doing -- different things for different teachers. Here the results were clear: the question-and-answer pattern was superior in all cases, apparently because it provided more chance to practice.

The unit costs of the Colombia television were quite low in 1965, and are probably still lower now with many more students in the audience. Torfs calculated the total annual current operational cost of the television in 1965 at 6.6 million pesos, the total annual depreciation and notional interest on the investment at 6.7 million pesos. At the 1965 rate of 18 pesos to the dollar, that would represent a total annual cost of a little less than $740,000 for carrying 251.25 hours of instructional television to 275,000 students, and 66.75 hours to an unknown number of teachers. These are the unit costs based on that estimate:

TABLE 27

Estimated Current Costs of Colombia ITV, 1965
(in dollars and cents)

	Per hour broadcast	Per student	Per student hour
Capital			
Production and administration	$3,265	$3.78	$0.075
Transmission	$1,395	$1.62	$0.032
Reception	$ 924	$1.07	$0.021
Total	$5,587	$6.47	$0.129
Current Operations (including amortization)			
Production and administration	$ 735	$0.85	$0.017
Transmission	$ 980	$1.13	$0.023
Reception	$ 597	$0.69	$0.014
Total	$2,313	$2.68	$0.053

(Lyle, et. al., op. cit., p. 71)

Torfs feels that using the official exchange rate of 18 to the dollar actually understates the true cost by perhaps 20 per cent; that is, prices and salaries are so different that the same operation would cost 20 per cent more in the United States. Even at that altered rate, however, the preceding table means that Colombia was delivering television for a capital investment of about $7.76 per student, and a current annual cost, including amortization, of about 6.4 cents per student per hour.

Teaching by radio in Thailand

Instructional school radio in Thailand dates to 1958, although the Ministry of Education had broadcast an educational home service for four years prior to that. The first school broadcasts went out to 286 selected schools on May 20, 1958. In 1959, the number of schools using the service was about 500, in 1963 about 2,000, in 1965 5,000, and in 1972 an estimated 6,245. The number of students has grown correspondingly, from about 30,000 in the first year to an estimated 1,000,000 today.

All programs originate in the Ministry studios in Bangkok. They go out from there by a 10Kw short-wave transmitter. Tapes are also sent to and broadcast by nine other medium wave stations in various parts of the country. These tape rebroadcasts are necessary because of interference from the large number of radio stations in Thailand.

The annual program service includes two social studies programs of 15 minutes each per week for each of four grade levels, one music program of 20 minutes per fortnight for each of five levels, and one English program of 20 minutes per week for each of eight levels. In general, the music programs go to all the seven grades of primary school, social studies goes to the first five grades of primary, and English goes to the upper three primary grades (5, 6, 7) and the five forms of secondary. On the average, each lesson is repeated four times. Thus, between 400 and 500 different programs are on the air each year, in about 3,000 repetitions. The total time of different programs on the air is about 165 hours per year, and the estimated total number of student listening hours to these programs is over 8,000,000.

This is a very typical program for the kind of radio we are talking about in this chapter. No course gets more than 40 minutes a week. Pupils in the first four grades get a total of 40 minutes of radio per week. Pupils in the fifth grade get 60 minutes; those in grades 6 and 7, 40 minutes; and all the secondary school students, 20 minutes per week. Obviously radio is not dominating the classroom; it may lead, it may stimulate, but it is far from taking over.

A case study in 1966 (Schramm, et. al., in UNESCO, 1967, vol. 2, pp. 83-102) made a rough calculation of the costs of Thai radio at that time. The total current costs, they estimated, were about 2.6 million baht ($123,500) per year, and the cost per student hour was between one and two cents according to how one estimates the number of hours.

This exercise was repeated in 1972, when the audience had grown by perhaps 25 per cent, some costs had risen, and a number of additional transmitters were being used. The base figures are still rather shaky, and the Ministry has no completely hard figures on the number of students who use its broadcast services. Nevertheless, an attempt was made to include all relevant costs, to charge an amount equivalent to rental of transmission facilities even though the Ministry had free time on many of its retransmitting stations, and to err, if at all, on the side of overcharging rather than undercharging costs. Table 28 represents the best estimate it was possible to make short of a detailed cost accounting.

Assuming 8,000,000 student-hours of radio listening per year, the basic unit cost is 0.41 baht, or just over two cents, per hour.

This is about one-third Colombia's cost of delivering about the same amount of television to another very large audience. It is far below the student-hour cost of El Salvador, Samoa, and other projects for which such estimates are available.

In 1958 and 1959 representatives of the Ministry conducted a large field study to evaluate the learning from instructional radio (Xoomsai and Ratanamgkala. 1962). Schools were selected at random from among those receiving the radio programs, and controls chosen from those nearest and most similar to the experimental schools. In grades 2 and 3, 622 students were tested on music and social studies; 572 from grades 6 and 7, on their ability to understand and write English.

The chief purpose of social studies in the primary grades in Thailand is to help pupils develop attitudes and values desirable in

TABLE 28

Estimated Annual Costs of Instructional Radio in Thailand

Item	Cost (in baht)		
Amortization of capital investments			
Transmitters and studio equipment (depreciated over 15 years)	116,000		
Building (over 20)	100,000		
Receivers (over 10)	249,800		
Notional interest on investment (at six per cent)	401,269		
Sub-total		867,069	
Current operations			
Production and administration	1,599,000		
Transmission	274,000		
Estimated cost of free transmitting time	400,000		
Publications for schools and mailing	85,000		
Workshops for teachers and school visits	60,000		
Sub-total		2,418,000	
TOTAL			3,285,069 baht ($164,253)

the Thai culture. In 26 of the 28 items of the grade 3 test, 18 of 28 in grade 2, the radio students scored higher (i.e., more in favor of the desired attitudes) than the controls. Sixteen of the differences in grade 3, 12 in grade 2, were significant at the .05 level or beyond.

Music students were tested on their ability to identify songs and musical instruments, and rated by classrooms on their singing and dancing. In the written tests of identification, experimental groups were superior to controls at the .001 level or beyond. Classroom ratings on singing and dancing were also significantly higher in the experimental schools, and observers noted that the variability in performance was reduced in the experimental over the control groups, hypothesizing that the radio instruction had brought the performance of the less skillful pupils nearer the level of the others.

No significant differences were found between experimental and control groups on ability to understand English. On tests of writing English, the radio group was superior in grade 7, the control group in grade 6.

The experimenters concluded that the radio teaching appeared to be effective in social studies and music in lower primary, and that the results with radio English in the upper primary were inconclusive.

This experiment has been replicated, with some methodological improvements, in 1972, but the results are not yet available.

Programmed instruction in Central Africa

When Rhodesia made its Unilateral Declaration of Independence in late 1965, that signalled the end of one of the most remarkable developments of programmed learning anywhere in the developing regions. Within a year, most of the individuals who had played key parts in this project had left the faculty of the University College of Rhodesia and were carrying on their work in other countries. David G. Hawkridge, who had been head of the operation in the Faculty of Education of the University, came to the United States and later became Director of the Institute of Educational Technology of the British Open University.

But in the years before 1966 the Rhodesia center had proved most convincingly that programmed instruction is not solely for the "developed" countries. Thousands of miles from any other center for the study of programmed learning, the members of that Rhodesia group had developed 75 programs, which were in various stages of testing at the time of the general exodus. They had used these programs successfully both with African and with European students, with professionals, skilled workmen, and many others. They had assembled an excellent collection of programs, studies of programming, and teaching machines from different countries, and had an active research program going. It was unfortunate for Rhodesia, and for Africa in general, that the program was turned off when it was. What it might have become can be imagined from a modest monograph of 88 pages, published by the Faculty of Education, University College of Rhodesia, as Occasional Papers No. 7.

This monograph is full of evidence on the teaching effectiveness of programmed instruction in the Rhodesian situation. Here, for example, are the results of an experimental comparison between two groups of agricultural extension recruits with only primary schooling. They were to learn the necessary arithmetic to measure and peg soil contours. One group was taught by means of a program; the other, by traditional classroom methods. These were the results:

	Pretest	Post-test
Program group (N=22)	32.9	67.3
Class group (N=20)	36.4	48.6

(Occasional Papers No. 7, p. 28)

Most of these comparisons were part of the process of validating and improving programs. Such programs ordinarily went through several revisions before they were ready for wide use. As an example, take a program entitled "How People Learn," intended for the use of adults with eight years of schooling who were preparing to be teachers or trainers (See Occasional Papers, pp. 29-31). The program was first tested on 28 participants in a course for prospective extension agents. Their pretest score was 45.6, their post-test, 91.2. The test was thought to be too easy, and was accordingly modified, and a number of items in the program were changed. Next, the program was tested on three classes of different kinds. Their gains were larger than the first group, but the program proved to need still further improvement in individual frames. This was done, and it was tested for a third time, on 25 assistants. Their mean scores were:

Pretest	Post-test
21.8	75.7
(range 0-50)	(range 44-100)

The program was then judged to be satisfactory and released for use in the extension service training program.

Some of the programs were intended for self-instruction in the African schools. Here, for example, are first validation tests of two academic programs in an African secondary school:

Program	Pretest	Post-test
Roots and Surds	20	68
The 1802 Factory Reform Act		
Form 3	6	87
Form 4	22	84

The test results from Rhodesia leave little doubt that programmed instruction works as well in developing regions as in economically more advanced countries.

One of the interesting accounts in Occasional Papers No. 7 is by a teacher who was attracted to Rhodesia by the opportunity to participate in the work on programming. His story links experiences in Singapore and Rhodesia:

I remember well some four years ago talking with several R. A. F. Education Officers at F.E.A.F. Headquarters, Changi, Singapore. The subject of teaching machines came up. This was the first time I had heard of such contraptions, and being a teacher of some 30 years' standing I was very sceptical and rather rude. Unfortunately, these officers knew very little about the machines or the ideas behind them, and I was left in complacent ignorance for several months until I read an article in the Times Educational Supplement and another in the Reader's Digest about programmed learning.

I had been teaching mathematics for much of my teaching life, and had felt frustration for a long time, especially with the average and not so bright pupils. The bright boys were all right; the response was there and the end product most satisfying, but these were only a small proportion of the pupils passing through my hands. How could I make the subject more interesting? How could I give more individual attention to the slower members of the class without holding back the brighter ones? How could I restore confidence to the "can't-doers" and the "blind-spotters" of mathematics? How could I increase the pupils' input comparative to my output of knowledge? What was the point in carrying home piles of exercise books and ploughing through them in the absence of the pupils, and not being able to do something constructive about it? These were questions which had forced themselves on me over the years, and I hadn't found a satisfactory answer by the time I read the articles on programmed learning.

I was always ready to give any method a try, and this method seemed reasonable. I started to programme a course in mathematics for a fourth year form, quite prepared at any moment to find that this was just another gimmick. I put into the programme as much experience as I had gleaned over the years in presenting the concepts I wished to teach, and away we went. I fed the knowledge to them in small doses, following each dose with appropriate questions and emphasizing points where, from experience, I knew snags would arise.

From the beginning the interest was there; the amount of work turned out was amazing; the atmosphere in the class was one of concentrated effort; the "can't-doers" were getting the answers right and were very happy about it. I was busy flitting up and down the class-room sorting out snags, keeping each pupil supplied with programme sheets, and still able to give individual attention where it was needed.

Then I had a piece of luck. After I had been doing this for about three months the R.A.F. Education people heard of my experiment, and sent one of their experts on programmed learning to Singapore. They had been experimenting for a long time in the training of apprentices and saw the possibility of using programmed learning in Service schools. They sent out S/L Thomas, now co-author of Programmed Learning in Perspective; he stayed some ten days, lecturing on the subject in the evenings and spending most of the days with me, since I was the only one doing this work in Singapore.

Fortunately for me, he found that I was on the right lines, and I learnt a lot from him, especially on the preparation of material before writing the programme.

I hadn't any teaching machines; the answers were on the back of the programme sheets, and the pupils checked by turning over these sheets to find the correct answer. This wasn't entirely satisfactory, since it did not eliminate cheating, but the pupils were very good about it on the whole. To get the maximum benefit, however, one must use a presentation device which is cheatproof, I have concluded.

The work continued for a year, and at the end of the year this form and a parallel form, which had had formal teaching on the same syllabus, sat the same examination -- a London GCE Algebra 'O'-level paper they had never seen before.

The results in the two classes, expressed as percentages, were as follows:

Programmed Instruction: 86 76 70 68 67 65 64 64 53 49 47 47 45 42 35 14 13.

Conventional Instruction:56 48 42 37 33 32 30 29 26 26 22 21 14 13 13 12 11.

Averages: Programmed Instruction 53.1
Conventional Instruction 26.7

These results, and the fact that there was no diminution of effort during the year, convinced me that there was something in the method, and on coming to Salisbury I was permitted to continue with the experiment, but this time with a IVc class, whose record of work was very poor. It meant working from the beginning in Algebra. Again, the interest was there from the start --

> it always is with a new method, but the test comes in maintaining this interest. There was no trouble at all on this point, and the class went ahead steadily, working all the time and enjoying the work. They made such progress that I was asked to enter them for the 'O' level GCE at the end of the year -- a year before they were due to take the examination. I wasn't too keen, knowing the amount of work to be covered: the basics had to be covered in addition to the examination syllabus. I decided to go ahead, and although the Algebra was covered adequately we could not finish the Arithmetic, Geometry and Trigonometry. There was, however, rather an interesting side issue. The programmes had stimulated the boys to work and this was reflected in their other subjects. So much so that three other masters decided to enter some of the boys for the examination.
>
> Ten boys were entered for mathematics; the resulting grades were: 1 4 5 7 7 8 8 9 9 9. These were considered satisfactory in the circumstances. They were C-stream pupils taking the examination a year before their time. They did satisfactorily in other subjects, and some of the boys now have up to five subjects at 'O' level. During the whole year the boys were given tests at frequent intervals to assess their gains in knowledge, and the results were most encouraging.
>
> The experiment is being continued this year, with a Third Form included, to try to cover the syllabus thoroughly and give ample time for revision.
>
> Both the third and fourth form classes have taken to the programmes as enthusiastically as their predecessors.
>
> (Occasional Papers No. 7, pp. 44-45)

Radiovision in developing areas

We have been disappointed in not being able to turn up new evidence on the effectiveness of radiovision in developing regions. This combination of filmstrips with voice (radio broadcast, tape recorder, or teacher) is inexpensive and relatively simple, and permits a school system to make its own materials, and teachers (especially if they do not depend upon radio to furnish the sound) to control the timing and repetition. It would seem to be precisely the kind of audiovisual tool that is readily adaptable to education in the newer countries.

Radiovision has been used most impressively by Britain and France, where teachers are accustomed to audiovisual methods and schools are equipped to provide them. It is being used in the Central African Republic, and has been used experimentally in Niger, Malawi, and some countries of South Asia. Lefranc in 1965-66 observed its use for literacy programs in Niger and came up with no hard evidence and a mixed report as to how it was working. For one thing, it played a very small part in literacy teaching. There were often problems with the projectors, and with coordinating radio and projection. When it was used, the voice of the teacher rather than the radio usually provided the commentary.

Pending more evidence, then, all we can say is that filmstrips, accompanied by teacher commentary and discussion, by a tape cassette or a radio broadcast, would seem to be well worth the attention of a developing country that seeks to enrich and extend the learning opportunities it offers.

Notes in conclusion

In a sense this chapter has merely amplified the evidence on learning from instructional media cited in Chapter III and the generalized cost figures in Chapter IV. It does not challenge the general conclusion of those chapters that any motivated individual can learn from any instructional medium if it is competently used and adapted to his level, and that under suitable conditions the media, especially the Little Media, can be used at relatively low cost.

Its addition to those early chapters is rather to illustrate that the same conclusions hold not only for North America and Europe, which were the source of most of the data in Chapters III and IV, but also for other parts of the world and especially developing countries.

The evidence presented here on the effectiveness of television (used for ongoing programs rather than system-wide reform or for extending the school) in Japan, India, and Colombia, of radio in Thailand, and of programmed instruction in Central Africa, should be very encouraging. The cost figures on television from Colombia, and on radio from Thailand, should also be encouraging. Television at 6.4 cents per student hour, radio at two cents per student hour, are not frightening costs if they can be proved to contribute to the effectiveness of teaching and learning. And the apparently successful adaptation of programmed instruction to the needs of students in Central Africa should help to dispel any fears about the usability in developing countries of that relatively sophisticated technique of individualized instruction.

It is hard to claim that any one medium is the medium for this kind of educational use. Rather, all media are. A wide program like that of Colombia or Thailand obviously requires a medium with broad coverage -- radio or television. A teacher who wants to use local materials or local views for his teaching does not ordinarily want television for that purpose. He wants low cost visuals or recordings or models; or he wants to take his students out to see for themselves. A teacher who wants to move his class along at their own best pace needs something *he* can control -- filmstrips, to take one example -- which he can leave on the screen as long as needed, or repeat as often as he wishes. A teacher who wants to give his students extra practice does not need radio or television or films; he needs a language tape or a film loop or a programmed text. The important lesson of this chapter is the same as that of Chapters III and IV: how many different media can provide effective learning opportunities, and how often one can save resources for other purposes by using the more inexpensive media.

VIII

MEDIA FOR NON-FORMAL EDUCATION

Non-formal education is not a sharply bounded concept. The most common alternative name for it -- out-of-school education, which is used by UNESCO -- is no sharper. It may or may not take place in a school building. It may or may not be under the auspices and control of a school system. It may or may not be conducted formally. It may or may not lead ultimately to a diploma or a degree. It is not the kind of education we think of as going on in the government primary schools of Niamey or the Plan Basico schools of El Salvador or Samoana High School in Pago Pago or Harvard University; on that, educators agree. But beyond that, non-formal education is whatever a writer chooses to call by the name.

Between "formal" education, such as we have discussed in three preceding chapters, and "non-formal" education, which is the subject of this chapter, there is a shifting and shadowy border. The only excuse for having such a concept as non-formal education at all is its central purpose, rather than its boundaries. And for this reason it is well not to waste time defining the boundaries, but to concentrate at once on the central purpose, which is to provide the population, young and old, some of the learning opportunities they have not had or cannot easily obtain in formal schooling.

The reason why non-formal education has taken on such importance in the less developed countries is precisely the failure of the formal school system to meet all the educational needs of the society. The formal system, world-wide, fails to reach half the school age population. The rate of dropouts is very high. The curriculum is largely irrelevant to the needs of many of the potential students. The system is very expensive, measured against the resources available. Educational expenditures now average 16 per cent of national budgets in the less developed countries; in at least 10 countries they are more than 25 per cent of the total budget. A sharp rise in educational investment since 1950 has succeeded in more than doubling enrollments in the LDCs, but this, in turn, has resulted in loss of quality and in widespread unemployment and dissatisfaction among school leavers. The great push to expand formal education has not been geared into the capacity of developing countries to absorb educated youth, nor the needs of these countries for particular kinds of workers in particular places. It has tended to ignore the adult segment of the adult population which also needs opportunities to learn in order to be maximally useful to national development. Non-formal education has risen in response to the conclusion of planners, educators, and donor agencies alike, that there must be a better way to expand educational opportunities than by means of the present formal systems.

Non-formal education is therefore distinguished by the part it plays, not by where its boundaries are. It does what the formal educational system does not do. It serves both young people and adults. It brings learning opportunities close to where these learners are, rather than requiring them to come to it. It is closely related to local needs and national goals. It may teach functional literacy, general or pre-vocational education. It may furnish on-the-job training. It may provide continuing education and refresher training. It may, and usually does, offer education for community improvement, including at one time or another national service programs, local group activities, community self-help, instruction in agriculture, fishery, forestry, management, family planning, sanitation, child-care, and political participation. But whatever substance it offers is more likely to derive from an estimate of today's needs and tomorrow's challenge, in a particular locality or country, than from a classical curriculum.

Consequently, non-formal education is a vast and amorphous area of activities and organizations, of enormous importance and endless variety. It is an area we shall have to sample rather than encompass. This we shall try to do in the following pages, concentrating on some of the uses of instructional media.

Media in Non-Formal Settings

If there is a medium for non-formal education, it is radio. The reason for this is illustrated by Paul Theroux's study of rural radio in Uganda, in which he reported that whereas 87.7 per cent of all the rural families he surveyed have no electricity, 86.3 per cent have radios (Theroux, n.d., p. 21). In other words, radio is the one long-range, easily deliverable medium that overleaps the commonest barriers to instruction in remote places.

But there is really no one medium for non-formal instruction. The patterns of media use are as varied as the education itself. At one end of the spectrum is the kind of non-formal education we shall refer to in the following pages as "localizing the school." In that task, media are of very little importance. At the other end there is the area of development campaigns -- family planning, agriculture, health, and so forth. Here the development organizations typically use every medium they can find, from radio to print to puppets to posters, and always including personal contacts with a field staff. If radio is the "chief" medium at this end of the spectrum, it is only because that provides the most direct channels to the most people. But no country would think of depending for a development campaign upon radio alone.

Thus, in Uganda whence came the figures we quoted from the Theroux study, the Guide for Extension Workers in Agriculture tells these workers that "Mass-Media are essential in your work," and advises them to become expert in the use, not only of radio, but also

Publications of many kinds
News stories
Circular letters
Exhibits
Posters
Motion pictures

Slides and filmstrips
Flip charts
Flannelgraphs
Wall newspapers
Bulletin boards
Photographs
Wall charts
Puppet shows
Local talent, drama, songs, poetry, music

One interesting feature of this list is the amount of printed material, despite the low literacy rate in Uganda. The agriculture ministry feels that not only will print reach influential farmers, but also that literates will pass on the message to others. A second feature of interest is what the guidebook has to say about these media. It recommends a combination of channels. For example, it suggests that entertainment, social events, and teaching be built into exhibits. It advises the extension representative "to supplement the motion picture with other teaching methods before or after the cinema is shown." It suggests that a village should receive not one, but most of the media listed. (Department of Agriculture, Guide for Extension Workers, 1968, pp. 33 ff.)

The variety of uses of instructional media in non-formal programs is fascinating. Take, for example, the use of films and videotape in the Canadian "Challenge for Change" program. The typical pattern of use might be to present a film demonstrating some desired form of community development. This has been done many times, without spectacular results. Then the Canadian Film Board decided to go to the community for its films. It sent a film-maker to live three weeks with a poor family. She produced a powerful and sensitive film, depicting what it means to be poor, with the intention of motivating people to want to do away with conditions like the ones in the picture. It was an artistic success, but a complete disaster for the family that had played host to the film-maker. They were teased and mocked by their neighbors, and the whole experience ended in bitterness. Too late it was realized that the film should have been screened for the family first, and their suggestions solicited. As George Stoney, who was at that time the producer of "Challenge for Change" said: "The film should have been screened for the family in their apartment, with just a few of the crew around. All the response would be sympathetic and understanding. Then, with the family itself doing the inviting and deciding who should come, it could have been screened at the church or any group where the family had connections and where people could start from a friendly base to see that the family was doing something, was involved in something important. Gee, they're going to be on TV! All this could have been done before the film was actually finished; then, if they wanted changes, you could make them." (Challenge for Change, p. 3)

So the Film Board tried another tactic. It sent interviewers and VTR cameramen to a disaffected mining area in Alberta. The interviewers talked to customers in stores, people in the pub, people in their homes, and asked what they thought of the situation in the

village. What did they like about it, what didn't they like? What would they like to see changed and did they have any ideas as to how to change it? All this material was edited down to one hour and presented at a community meeting. Over half the people in the village came to see themselves and others on tape. The meeting ended in heated discussion, and in formation of committees to take up the main problems that showed up in the interviews. One old man said: "I've been playing cards with these guys for years, and we didn't know what the other guy was really thinking about the place until we had to speak out for the camera." The first meeting was followed by others, and by community action, and change began to take place: a cleanup, a public park, installation of gas and water lines, a small factory, a fire engine and a home-built structure to house it, a social center for the valley, and so forth. (Challenge for Change, p . 6)
So, as Canada proved, there are different, and creative, ways to use media in non-formal education.

In this chapter we cannot hope to represent all the variety that exists. Rather, we shall try to represent the variety by five of the most common patterns. First, the process of localizing the school, which takes many forms but represents typically a minimum dependence upon media. Secondly, three combinations of groups with media: the deciding group, the study group, and the discussing group. And finally, the use of media in development campaigns, which we shall illustrate with family planning.

Nature of the Evidence

Research is sparse in this field. Less than one per cent of all the published reports on non-formal education are accompanied by hard data. Non-formal education has come to be considered a priority subject too recently to attract large amounts of research money from agencies concerned with economic and social development. Thus, for example, the long history of "adult" and "out-of-school" education in Scandinavia has always been considered something to be done, rather than to be studied. When UNESCO helped India install the radio rural forum in villages around Poona, it sponsored a competent study of the pilot project, but dropped the research before India faced the problem of expanding the pilot. Radio Sutatenza, one of the largest and best known of the rural non-formal projects, has had almost no quantitative research in 25 years. Very little hard data exists on the institution of the "animateur," which has been so important in French Africa. The greatest outpouring of research has been on development campaigns -- health, agriculture, family planning, and so forth. Much of this research, however, has not dealt directly with the media component, and, therefore, will be of less use to us in this chapter than we might hope.

Unfortunately, there is even less cost data than data on effectiveness. This is all the more regrettable because of the variety of media used, and the possibilities of media comparisons.

We shall cite such data as we can, and the chapter may serve, if not greatly to illuminate what has been done, at least to suggest what research needs to be done.

Localizing the School

In a strongly stated argument to the Bellagio Conference of May, 1972, Ralph M. Miller, a Professor of Education at the University of Calgary, said:

> In spite of warnings offered by C. Arnold Anderson and Phillips Foster about the futility of trying to "ruralize" education, we must seriously ask what contribution education can make to rural living. Perhaps the urban drift cannot be stopped, but even more certainly the modern sector cannot expand fast enough to absorb the rural-urban migration. If people are to find meaning in their lives, unless enlisting among the urban unemployed be accepted as meaningful, they must be encouraged and helped to find new possibilities in rural living. Education alone certainly cannot revitalize rural life, it can only be a part of the total effort. But if we accept that education can accomplish nothing in this respect and that the only education people will accept is that aimed towards modern sector jobs, then we must confess the utter irrelevance of education to current development imperatives.
>
> It is only schooling -- education carried on under the familiar ritualistic forms -- which is irrelevant. What we need to turn attention to are alternative forms of education which are developed in relation to local needs and which utilize local skills. Local initiative must be emphasized, for the non-formal educational models of the developed world are often wildly inappropriate to conditions in developing countries. . . .
>
> 1. Education must become less formal.
> 2. Education must be freed from system restrictions and be developed through a variety of specific projects on a smaller scale.
> 3. Education projects must be recognized as experimental and must be monitored so that we may find out what works in specific situations.
> 4. Education must become more of a service within a complex of development efforts and less of an instructional program for the sake of instruction.

(Miller, A/D/C Reprint, 1972, pp. 8-9)

Regardless of who is right about the feasibility of "ruralizing" education, the spirit of this quotation is the spirit that has moved a number of less developed countries, particularly in Africa, toward localizing their rural schools and removing them from the formal pattern. For example, President Nyerere's influential publication of 1967, Education for Self-Reliance, insists on a complete reappraisal of the purpose of the school in village life. President Nyerere's theoretical statement draws to a considerable extent upon his own acquaintance with the village school in Litowa, in Southern Tanzania, and this is a good example with which to begin.

The Litowa school began with a change in the community, rather than vice versa. The Tanzania rural society is typically made up of isolated dwellings, and of farmers who move every few years to cultivate new land when their own fields wear out. However, the farmers around Litowa decided to live together in a village, give up their individual plots of land, share the work, share the profits, and create a truly cooperative society. Litowa was the first village in a group of 12 to be formed in this way, and as such became the home of the school for all 12 villages. Therefore, the question arose: what kind of school?

The traditional schools of Tanzania are highly academic, with a classical curriculum, the students aiming toward winning one of the few available secondary school places in the country, from which the successful graduates might then go on to government jobs, urban careers, and possibly higher education.

This pattern did not fit the goals of Litowa. For one thing, for almost all pupils that school would necessarily be terminal education. Almost every pupil had to look forward to a career, not in the civil service, but in subsistence agriculture. The graduates were needed in the rural regions, not in Dar es Salaam. They had very little need of an understanding of European history, and a very great need to understand the problems of their own communities. In other words, the end of education in Litowa was seen not as entrance into a distant secondary school, but active participation in a revolutionary community close by. (See Wood, 1971, pp. 4 ff.)

The teachers at Litowa are furnished by the Ministry of Education, but they do not now teach the classical curriculum. As soon as they come to Litowa they are brought into the village council as full members, and the whole council has a great deal to say about the curriculum. The students are taught to read and write and calculate, of course, but their schooling has two characteristics that are not common to the curriculum inherited from the colonial period. In the first place, the basic, the pervasive subject, is the principle of cooperative living and work-sharing, in preparation for entering the adult society of Litowa or one of theother villages. This pervades the first four grades, in the form of stories, songs, drama, discussions. In the upper three grades the principles of growth through cooperation are studied more theoretically, along with the economic and political problems and policies of the nation.

In the second place, productive labor -- farming, weaving, nursing -- is a part of every child's life in school. In older schools, labor had been used as a form of punishment. At Litowa a new attitude toward labor is created, not something by which one is punished or which one has to do to keep the bush from taking over the school, but a natural and expected part of life by which one contributes to the prosperity and progress of the village. As children grow older they are allowed themselves to supervise the work projects. Much of the administration of the school is delegated to an elected executive committee of students, which is parallel to the executive committee of the village, and reports to a pupil assembly corresponding to the village council. It is responsible for the welfare and conduct of the students, and for the planning of the work projects. Thus, what the student is taught in school is no more significant than what he does in school, and both experiences are designed to prepare him for a useful and dedicated life in his own community.

Perhaps the most important point to note about the Litowa experience (as Wood points out in his very good account of it, op. cit.) is that at least the beginning of a reconstruction of rural society preceded the beginning of a new form of rural education. Once the first step was taken, it was relatively easy for the community to voice its needs to the school, and for the school to adapt to them.

What part do media plan in a localized school like Litowa? At present, virtually no part. Media do play some part in the development and reconstruction of the village, however. The district training center, where local leaders come for guidance and instruction, is supposed to have a "library/radio/information room" (Establishing

District Training Centres, 1968, p. 8). Radio, with practical instruction in agriculture and health, and talks on national policies and priorities, comes into the village. So do pamphlets and posters on development subjects. When extension people come in, they often bring films or filmstrips with them. So far as the school is concerned, however, there is no part of the instruction regularly given over to radio or films, and no television is available. But because the school is such an integral part of the village, the presence of media in the village is reflected also in the school.

If time and space were available it would be interesting to compare this experience in Tanzania with the experience of some of the French African countries in trying to localize and ruralize their schools. The difference can at least be suggested by a few notes on the attempted reform of primary education in Chad. (For a good account of this, see the paper on the "Mandoul" project, submitted by the French delegation to OECD Development Assistance Committee, 1972).

In 1966, the Government of Chad decreed a reform in primary education which provided for "changes in the curriculum of all primary classes for rural purposes. The purpose of this change was to adapt education to the development needs of Chad -- crop and livestock farming -- by preparing the children for a life in a rural environment." It provided also for exclusion of older children from primary school -- to keep them from "making a career" of schooling rather than entering useful labor -- and for the introduction of teaching reforms devised by the Pedagogical Research Group of the

Secretariat of State for Foreign Affairs (Co-operation). These latter reforms included the teaching of French for the first time as a foreign language, so as "to dissipate the magical aura which has tended to surround the French word." They included also the introduction of simple logic to train the child's mind, and from the third year onward, the study of the environment.

This altered system was put into use in the Mandoul region of Chad in 1967, with a team of trained teaching assistants, and seemed to work rather well, given these reservations stated by the authors of the French project (op. cit.):

> The reform can be regarded as an effective approach to solving the school problem, but with the limitation that it involves no change in the way parents or teachers perceive the role of the school. Irrespective of what may be taught or what methods may be used, the parents still take no direct interest and regard the school as a means of socially upgrading their children. This inevitably causes parents to relinquish their educational functions to the teacher, who neither can nor should perform them. In these circumstances children attending school are irrevocably cut off from their environment, whatever teaching efforts may be made toward integration. Attempts by the school to relate to its surroundings by studying the environment come up against the failure of the parents to understand the point of it, to accept the child as a questioner, or to see how the village can have anything to offer their children, whom they destine for the civil service. This attitude on the part of the parents is also that of teachers who fail to reassess their role in the village, with the result that the child's approach is to regard his living as an object for observation, external to himself. Any every-day reality brought into the classroom through the surveys is then transformed by the alchemy of the French language and of writing to become a school subject like any other.
>
> (The "Mandoul" project, p. 4)

Thus far the project was at best a limited success. It represented a technical improvement in the school, but did not succeed in integrating the school and the future careers of the pupils into their communities. Therefore, the Rural Development Agency set in motion a major effort to change the attitudes of the adults toward the school, the teachers toward the adults, and the children toward their role as pupils and as members of their community. "Unless far-reaching action is taken to reorganize these relationships," wrote Jacques Mercoiret, "we hardly feel that any change inside the school alone will lead to its integration."

The major step was to get the teachers and the parents talking. This was accomplished in a series of meetings, with the community development staff acting as intermediaries. The parents were asked to define what they thought the school and the teachers were doing. The teachers were asked to describe what they were trying to do, and why. The parents were asked to describe the objectives of traditional education, so that the teachers could become aware of the ancient education going on all the time around them. Then the discussion turned to what services the school should be performing for the village -- what should be preserved out of the traditional educational patterns and what was helpful in the new system. Out of a great deal of talk of this kind, so it is reported, a new relationship and a new set of understandings grew up between villagers and teachers and began to include the pupils also. This required much patience on the part of the teachers, and a long step forward on the part of the villagers. One important thing that happened about this time was the offering of classes in fundamental literacy to adults, so that they would gain some necessary technical competence, and also would have a shared experience with their children.

The parents took a more active role in their children's schooling. They began to supervise the children's attendance and check on their progress. An arrangement was made by which, from time to time, one of the villagers would sit in a class and then tell the other villagers what was happening. Certain of the older villagers were invited to the school to tell the children about things the old people knew which they feared were being forgotten. A cotton field was set aside for the school children to cultivate under the supervision of an adult chosen by the villagers. And thus, gradually, the school grew closer to the life of the village, and mutual understanding increased on both sides.

It is interesting to note that Tanzania and Chad began at opposite ends of the relationship. Tanzania reconstructed a village society and the village then actively moved toward the kind of school it felt it needed. Chad began by decreeing educational reform, and then had to take extraordinary action to bring the village society and the school together. But they were both aiming toward the same goal -- a school system of, by, and for rural society. By one or the other means, the villagers were being encouraged to take a much more active part in the operation of their own schools. And practical work combined with classroom study was one device used in both systems.

An even more localized kind of schooling tried in a number of places within French Africa is the Rural Family Homes system, in which a student combines 15 days of practical work with eight days study at the center, then 15 more days of practical work, and so on. This has proved to be a very realistic way of training young people in development skills, looking toward rural careers, and involving the local Farmers Association actively in the process of schooling.

It is obvious that instructional media are far from being the key to success in this type of non-formal education. Nor, for that matter, is central curricular reform the key to it. So far as there is a single key, it seems to be a change in the community itself -- a change in attitudes toward the school, a redefinition of the kind of school it needs, and active participation in bringing the school into the ongoing development of the community. Once that is accomplished, then it is predictable that increasing uses will be found for media in teaching, as they have been found everywhere else.

Non-Formal Education: The Deciding Group

The combination of groups with instructional media is an obvious one for any kind of education that tries to bring learning opportunities to people, rather than people to schools. Groups can reinforce the work of lonely and remote students. They can provide practice and mutual criticism. Where action is necessary, they can provide an opportunity for talking it over and coming to a community decision.

Three kinds of groups have been more prominent than others in programs of non-formal education in developing countries. These are the *deciding* group (of which the best known example is the radio rural forum of Canada, India, and elsewhere), the *study* group (examples of which are Radio Sutatenza in Colombia and the Centro di Telescuola which operated in Italy in the late 1950's and the 1960's), and the *discussing* group (which has been used widely, among other places, in French Africa). There is a limited amount of research on the deciding group (used in combination with radio or television), surprisingly little on the study group, and virtually nothing except description on the discussing group.

The Indian experience

The pattern of the radio rural forum was developed and carried on for a number of years in Canada (Shea, et. al., 1954). The pattern was adopted and tried briefly in several parts of India, and then was applied in a UNESCO-sponsored pilot project in 144 villages near Poona in Maharashtra State in 1956.

In India the radio rural forum is a group of 15 or 20 villagers who are willing to come together twice a week to listen to a radio program dealing with agriculture, health, literacy, education, local self-government or other aspects of economic and social development, talk over what they have heard, and, where appropriate, decide to take community action. The program is from 30 to 45 minutes long, and includes news of interest to a rural audience, a talk by or an interview with an expert in some development field, sometimes a dramatization, sometimes feedback from the listeners to earlier programs. There is a convenor (chairman) and a secretary who is supposed to send a report of the meeting back to the district headquarters. Often a member of the community development field staff is present also.

In the pilot project at Poona this pattern worked very well. The results were studied by Dr. Paul Neurath (Neurath, 1960), who was at that time a visiting staff member of the Tata Institute in Bombay. He was able to compare the forum villages with villages that had no forums, some of which had village radios, some of which did not. He and his staff interviewed every forum member before and after the pilot project (which lasted for 10 weeks, 20 programs), and also made before and after interviews with samples of 20 adults from each of the control villages. During the project, each forum was visited and observed four times.

Neurath's findings, in brief, were that forum members learned a great deal more about the topics under discussion than did adults in the villages without forums; and in those non-forum villages most of the learning gains were made in the villages with radios. This is his chief table:

TABLE 29

Learning Test Results: Forum vs. Non-Forum Villages, Literates vs. Illiterates

	Literate members		Illiterate members	
	Forum	Non-forum	Forum	Non-forum
Pretest	7.1	5.3	3.1	2.1
Post-test	12.2	6.5	9.4	3.1

It is interesting to note that the illiterate members of the forums actually gained more than the literates, but, of course, started lower.

Neurath concluded also, after tabulating reports from the villages, that each forum averaged at least "six decisions for action" during the pilot project. There is no evidence as to how many of these decisions actually were followed through, but pictures and observational evidence indicate that at least a number of them were.

What did all this cost? Schramm, et. al. (1967), tried to reconstruct the cost figures for the pilot project. Subtracting the cost of the evaluating, they calculated it cost 416.57 rupees ($97.48) to organize and maintain each of the 144 forums for 10 weeks. That represents a cost of about $4.38 per meeting. If each forum did indeed take "six decisions for action," then the cost of bringing about each decision was about $14.58. If only two of the decisions actually resulted in action, then the cost per action was $43.75.

That cost-effectiveness ratio looked favorable to the Government of India. They could not think of any other way by which they could realistically hope to bring about a community improvement project for that price. So they moved to expand the forums as widely as possible over India. The expansion began more slowly than expected. The pilot ended in April of 1956; it was the end of 1958 before the social education officers began to move into the expansion project, and November 1959 before the decision was officially taken to expand the forums throughout India. Twenty-five thousand forums to be attained by 1966 were set as a goal. (For a description of this period, see Bhatt and Krishnamoorthy, 1965.)

The goal proved impossible to achieve. Most of the momentum from the Poona project had been lost. Indeed, some of the radios and all of the field staff had been withdrawn as soon as the pilot was over. The expansion was less well financed than the pilot. It had fewer field personnel assigned to it, and it had little of the morale and enthusiasm of the pilot. For the field staff, the Poona forums were a high priority item; the later forums were less so. There was less training for the officers, and less attention was paid to making the radio broadcasts fit the needs of a particular agricultural region. Receiver maintenance was not as good, and printed materials tended not to arrive on time. In other words, the pilot project was undertaken with dedication, and in the blaze of attention. The expansion was not. The radio rural forum proved to be not a good enough idea to run itself; it still needs adequate support and adequate staff. And the problem of expanding a pilot project nation-wide, especially over a nation as diverse as India, is a problem entirely different from making a successful pilot.

The goal of 25,000 was reduced to 15,000. At the end of the set period, 1966, it was reported that over 12,000 forums had been organized, but a number of them were believed not to be active.

There was no systematic research on the expanded forum project. Some rough estimates were made of costs, and it could be demonstrated that economies of scale operate in this case as with many other media projects. For example, the estimated cost of organizing a forum when the number of forums had reached 2,000 was less per year than it cost to operate one of the Poona forums for 10 weeks. But the important implication of the later cost estimates is to discount the common belief that the radio rural forum can be introduced for very little additional cost. This opinion had come to be held because (a) additional costs to the radio station are indeed small, (b) many of the field costs are hidden in other field budgets, and (c) the necessary field support had been consistently underestimated. Such costs can remain hidden if there are only a few forums, but when one talks about thousands of forums, then either the costs come out of hiding or the forums are inadequately supported.

Even so, the cost-effectiveness ratio of a rural deciding group supported by a radio broadcast looks favorable. If the true costs of bringing about community development projects are what they were calculated to be in Poona, then it must be asked what alternative procedures would do better. There is very little reason to believe that radio listening without a group would start much community action, or that a field staff -- even if the necessarily large and well-trained one could be obtained -- would do as much for the same cost. Therefore, the pattern of the radio rural forum, despite its disappointing expansion in India, still looks very promising for developing countries.

The Ghana experience

In at least two other countries, rather careful research has been conducted on the radio rural forum. These are Costa Rica (Waisanen and Durlak, 1967) and Ghana (Abell, in UNESCO, 1965). We shall briefly report the results from Ghana.

The project in Ghana was an attempt to adapt the pattern of group listening to farm radio as developed in Canada and India to the needs of an African country. Canada furnished two advisers, including Dr. Abell who conducted the field research, and UNESCO gave financial assistance. An area of about 1,250 square miles in Eastern Ghana, where most of the people speak Akan, was chosen for the experiment, and 60 experimental forums were organized in 40 villages. For purposes of research, 40 other villages were designated as controls. Twenty programs were broadcast, one a week, between December 1964 and April 1965. Only about one out of four programs dealt directly with agriculture; others took up problems of improving family living, problems of national policy, and relationships with the government. On the day of the broadcast, each forum met and exchanged ideas on the topic, then listened to the broadcast and discussed it. A secretary reported back to headquarters the ideas and conclusions of the forum and any action they decided to take in their communities.

Thus, the procedure was very much like India's, and so was the research design. Villages were selected as nearly as possible at random within strata -- small, medium, large population. Twenty villages were assisted to organize one forum each (called a Type A village), 20 others to organize two forums each (Type B), 20 villages had no forums but were each supplied with a government-owned village radio, and 20 other villages had neither forums nor village radios, although some of the people in them had private radios. Less attention than in India was paid to tabulating the community development of projects brought into being through the forums, but a large sample of the forum members were interviewed before the first broadcast and after the last one on what they had learned from the broadcasts and what action, if any, they had taken or planned to take.

The most interesting results of these before-and-after interviews can be summed up in tabular form:

TABLE 30

Some Results of Rural Radio Forums in Ghana

Question	Percentages by type of village Type A (one forum) N=89	Type B (two forums) N=82	Type C (radio, no forum) N=84	Type D (no radio, no forum) N=83
Action taken to increase production?	60%	53%	42%	35%
Production cooperatives planned or formed?	17	13	7	2
Action to improve marketing of crops?	25	23	21	9
Marketing through a group or a cooperative?	19	19	18	7
Action to improve harvesting, storing, transporting crops?	27	24	8	13
Joined a cooperative within six months?	16	19	5	6
Able to name cooperative started somewhere within six months?	55	43	35	28
Correct ages for introducing different protein sources to baby's diet?	51	46	41	36
Now saving on a personal basis?	70	60	57	50
Emphasized young people's needs for general education?	11	11	25	39
Emphasized need of practical training?	87	87	72	61

(Source: Abell, in UNESCO, 1965, pp. 36-40)

These interviews left little doubt that participants were learning and being encouraged to action by the forum experience. The last two questions are interesting in that they indicate the practical emphasis of the forums. Non-participants tended to value education more in the traditional academic pattern; participants tended to value education aimed at improving village life and opportunities close to home. The other answers, however, show quite clearly that the forums were able to bring about greater changes than the public radio without a listening group, but that a considerable amount of information was being absorbed from the radio by itself.

No economic analyses were reported for the Ghana radio rural forum project.

Some related research

Jain, in a doctoral dissertation (1969), critically reviewed previous literature on the effect of radio rural forums, and then reported some research of his own in India that was intended to clear up unanswered questions concerning the use of a deciding group.

He pointed out, justifiably, that the results of the Neurath study in India, the Abell study in Ghana, and others were all subject to possible contamination. This is endemic to field studies built around ongoing and fairly lengthy projects. For more reliable results he turned then to the experimental literature on group decision, much of it in the tradition of Lewin, and summed up a number of the most relevant studies in this table:

TABLE 31

A Comparison Among Important Studies on Group Discussion and Decision Making

Author(s)	Innovation Studied	Subjects	Important Findings
Willerman (1943)	Whole wheat bread	Students	Group decision is more influential than a request for change.
Bavelas and others (1947)	Unpopular meats	Red Cross volunteers	Group decision is more influential than a lecture.
Radke and Klisurich (1947)	Fresh and evaporated milk	Women neighbours	Group decision is more influential than a lecture.
Radke and Klisurich (1947)	Orange juice and cod liver oil	State hospital mothers	Group decision is more influential than individual instructions and lectures.
Coch and French (1948)	Work methods	Factory workers	Group participation is associated with job satisfaction and productivity.
Allinsmith (1949)	Self-recitation study method	Students	No significant results.
Beardslee (1950)	Self-recitation study method	Students	No significant results.
Bennett (1952)	Participation in research	Students	Group decision and perceived consensus are more influential than group discussion and public commitment.
Bond (1956)	Breast cancer detection	Women	Group discussion is very effective.
Pennington and others (1958)	Ranking of cities according to their population size	Students	Group discussion and decision are more influential than any one of them.
Brown (1965)	Risk taking behavior	Students	Group discussion is not necessary for increasing risk taking behavior.
Kogan and Wallach (1967)	Risk taking behavior	Mostly Students	Group discussion and decision are more influential than a lecture, information exchange, balloting, and consensus in increasing risk taking.

(Source: Jain, 1969, p. 14)

Jain then purposely selected a number of villages in one area of India, trying to match them in size, availability of mass media, and level of development. In each of these villages he assembled a volunteer group of adult farmers, and assigned them to different experimental conditions: group listening alone, group listening plus discussion, group listening plus group decision, group listening plus discussion plus group decision, and public and private commitment plus either group listening or group listening plus discussion. He had them listen to a 25-minute tape recorded broadcast on a topic of current rural interest, and then let the discussion go on for 40 minutes or so. His measures were after-only, and made use of semantic differential scales to measure attitudes, direct questions to measure beliefs and behavioral intentions, and such tests as raising hands or volunteering one's name to measure commitment.

From this field experiment he emerged with two clear findings and a number of inconclusive ones. The two clear results, however, are of considerable importance in understanding how the radio rural forum works.

He was able to show, for one thing, that group listening followed by group discussion is more influential in changing attitudes, beliefs, and behavioral intentions toward adopting an innovation than is group listening without discussion. This is shown by his table, which we have numbered Table 32.

TABLE 32

One-Way Analysis of Variance Results for the Means of Radio Listening and Discussion Groups on the Effect Variables

Effect Variables	Effect variables means for the Radio listening group	Radio listening plus group discussion	F Value
Attitude	7.29	9.78	4.35*
Belief	7.76	9.90	4.08*
Behavioral intention	3.00	4.13	4.75*
	(N=34)	(N=40)	

*Significantly different at the 5 per cent level.

(Source: Jain, 1969, p. 18)

He then tested the importance of group decision. Comparing group listening with and without group decision, he got only one significant difference in three tests -- this in favor of group decision. Comparing group discussion plus group decision with group listening plus decision, he found all the differences favoring discussion plus decision, but again only one significant difference. This was an important one, however: the measure of behavioral intention. But results like these must be regarded as inconclusive.

Finally, he tested the effect of different combinations with private and public commitment. He found that combining private commitment with either listening or discussion groups made very little difference. But when public commitment -- i.e., an individual in the group openly committing himself to the innovation -- it was significantly more effective when preceded by discussion than when it came only after listening. He got two significant differences out of three, as the following table shows.

TABLE 33

Influence of Public Commitment on Listening and Discussion Groups

Effect Variables	Means on effect variables under public commitment condition		F Value
	Listening group	Discussion group	
Attitude	7.50	11.56	2.02
Belief	6.00	12.44	8.90*
Behavioral intention	2.08	4.67	6.60*
	(N=12)	(N=9)	

*Significantly different at the 5 per cent level.

(Source: Jain, 1969, p. 21)

The field staffs who have worked with the farm forum in half a dozen countries, and the group dynamics researchers who have been studying group processes in the tradition of Lewin, will be interested but not entirely surprised to have this additional confirmation from field experimentation in a developing country that the most potent elements in the radio forum are group discussion after the broadcast and public commitment to action after the discussion.

Non-Formal Education: The Study Group

The study group is so important to non-formal education that it is amazing to find so little hard data on it. What the school as a social unit is to formal education, the study group is to non-formal. It is the device by which non-formal students, near their homes, can be brought together to practice, to reinforce each other, to relate the teaching to their own communities, and to benefit from whatever supervision or guidance can be provided.

Furthermore, such evidence as there is indicates that addition of a study group is exceedingly helpful. Comstock and Maccoby (1966) found that teachers, given informal training by television in the New Math, learned more when they viewed in a group than when they viewed alone, more when the group actively discussed the lesson than when it did not, and still more when the group was supervised and directed. The experience of the Italian Telescuola (Lyle, et. al., in UNESCO, 1967) demonstrated to its directors that the study group was an essential part of the process. In Australia, whenever it was possible to bring together as many as five or six children, in the remote areas, to form a study group and listen to the radio lessons together, this was regarded as a cost that paid its way in effectiveness. These examples were all on the borders between formal and informal education, but the lessons are clearly applicable on the informal side of the boundary.

A cross-cultural study in India and Costa Rica (Roy, Waisenen, Rogers, 1969) made a start at comparing the usefulness of some group devices, in this case the radio forum, the literacy reading group, and the animation training of community leaders. The difficulties with such a study can be predicted: the cultures and conditions are different, the group procedures are different in purpose, the relative skill in operating them may be different. And all these difficulties did indeed appear. But when the studies were put together, the authors concluded that more was achieved by the radio forum (the deciding group) to "persuade people to accept certain technological changes necessary to achieve a higher level of living, thus speeding up the process of rural development" than by the literacy reading group (the study group), and more by either of those than by the training group. The authors said that the failure of this latter method "to show appreciable effects" may have been due to the "inadequate procedure by which the treatment was conducted." Similarly, the lesser accomplishments of the study group may have been precisely because its main purpose was to help people learn to read, rather than to make them accept technological changes. A comparison of the discussion and deciding group with other kinds of groups must therefore be made only with caution and reservations. And perhaps the most interesting finding of the study by Roy, et. al., is that both the deciding and the study group did help bring about some community change and innovation.

The most useful way to examine the combination of radio and the study group may be to look at the experience of the oldest of the continuing non-formal education projects built around this combination: Radio Sutatenza in Colombia.

The development of Radio Sutatenza

In 1947, Father José Joachim Salcedo, who was then curate at Sutatenza, a small village 90 miles from Bogotá, decided to try to use the radio to bring education and inspiration to some of his people. With a homemade radio transmitter and three radio receivers he started a non-formal radio school in the valley of the Tenza, where 100,000 people lived, 80 per cent of them illiterate. He received help from the government -- equipment and a method for teaching literacy. He received help from UNESCO -- advisers in developing broadcasting skills and a suitable program. He received help from countless volunteers in the villages, from village priests, from outside donors and advisers. He founded an organization called Acción Cultural Popular.

From this homemade transmitter and the three receivers has grown Colombia's largest radio network. It now serves upwards of 20,000 radio schools and some hundreds of thousands of students. It has probably taught many hundreds of thousands of rural Colombians to read and taken many of them through a program of basic skills and rural education. From its headquarters in Bogotá, Radio Sutatenza broadcasts 19 hours a day, and feeds much of this to three radio stations in other parts of the country, each of which contributes about one-third of its broadcast time locally. Acción Cultural Popular publishes the most widely read weekly newspaper in Colombia, has a full-time staff of 200 in Bogotá in addition to 130 employed in the editorial and publishing office, maintains 200 field workers, and relies upon hundreds of parish representatives, some hundreds of literacy group supervisors, and 20,000 unpaid auxiliaries who work in the radio schools.

One reason why Father Salcedo has been able to develop Acción Cultural Popular in this spectacular way is the lack of opportunity for education in the rural parts of Colombia. The rate of illiteracy is about three times in the country what it is in the cities. Schools are not available throughout the rural regions, and few of them offer a full five-year primary. In 1964, the International Bank estimated that 64 per cent of those schools offered only one or two years (to the students who could get in); and that only about three per cent of rural students who entered the first grade completed the fifth. Education beyond the fifth grade hardly exists in the rural regions.

But Father Salcedo saw the function of Acción Cultural Popular as doing more than filling gaps in the rural educational system. He aimed at providing educational experiences that would let the campesino (the peasant farmer) "develop from below." He wanted to create a "new type of Latin American man" who could throw off the fatalism and paternalism resulting from poverty and from dependence upon higher authority, and substitute a new vision of what a campesino could be and do. Acción Cultural Popular therefore stated as its objectives:

1. Motivation of campesinos for development
2. Human promotion: creation of the "whole" man, understood

in terms of physical well-being, intellect, spiritual and creative senses, and capacity to fulfill social roles

3. Integration of the campesinos into society through an effort "to diminish social distances and seek to ensure that all citizens have access to the opportunities and services that society has to offer and participate in them"

4. Organization and development of the community, especially through participation in local organizations

5. Productivity: increased production through new agricultural technologies, increased sales of agricultural products, creation of capital through investments, savings, credit, better use of resources, and finally an increased sense of the value of work

6. Spirituality of development

(Quoted in Brumberg, 1972)*

This hardly sounds like the academic primary school in Colombia, and indeed, it called for a quite different curriculum for the radio schools which Father Salcedo began to set up in 1947.

This curriculum covered five main content areas: health, literacy, mathematics, economy and work, and spirituality. It is obvious that this "fundamental integral education" is for a campesino of any age and is directly related to the problems of the improvement of rural life.

The radio school -- Sutatenza version of the study group

This curriculum is for the "radio school," which is neither a building nor a formal organization, but rather a group of persons who have decided to study. The average number is six to 10. They come from the same neighborhood, often the same family. They are usually brought together by an auxiliar (auxiliary), a helper who volunteers to organize the radio school. He is not paid for it. He has little or no special training for it. He may have been through it himself, and in any case he ordinarily has a little more education than the students he brings in. He organizes the group, finds a way to obtain use of a radio and a meeting place (usually in a student's home), and then serves as a group leader until and unless other leadership emerges. He usually listens along with the students and learns with them. If a student seems to be withdrawing from the study group, he tries to find out the reason and do something about it if possible. In other words, he does what he can of what needs doing, and the group shapes itself and its procedure.

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*See Brumberg, 1972, and Acción Cultural Popular, Programación, 1969.

The essential procedure is to meet together, listen to the lesson broadcast, then talk it over and practice it if that is called for.

The school functions at three levels. There is a basic course, primarily for teaching literacy, primarily for adults. This lasts about six months, has 30-minute daily broadcast lessons, and enrolls about 25 per cent of all Acción Cultural Popular's students.

At a slightly higher level is a two-year progressive course which is intended for farm families who are literate but have incomplete primary education. This is the main course. It is the level at which the five-fold locally-centered curriculum -- health, literacy, arithmetic, economy and work, and spirituality -- is taught. It has an hour-long broadcast every day, six days a week. And it enrolls 60 per cent of all Sutatenza's students. For a sample of the weekly broadcast lessons in the progressive course, see Figure 15.

The progressive course is terminal for most of its students. It is supposed to prepare them for rural life and motivate them to improve their communities and themselves. But it *need not* be terminal. ACPO has added a third course, a *complementary* course, lasting three years, and aimed at preparing students to graduate from primary school. Therefore, the content of the complementary course is the systematic curriculum of the primary schools: it must get its students ready for the school leaving examination. Most of its students are older than those in the progressive course; some of them are aiming toward further education, some toward jobs that require a school certificate. But the importance of this service as compared to the less formal parts of the Acción Cultural Popular schooling is shown by the fact that only 15 per cent of the students are enrolled in it. In other words, most of ACPO teaching is for students who are preparing themselves for a better life in the rural areas, not for further education.

Use of the radio

Radio Sutatenza operates a 250Kw station at Bogotá, two 120Kw stations in Cali and Barranquilla, and a 10Kw station at

Figure 17. One Week's Programming Schedule for the Progressive Course

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
ECONOMY & WORK (6) Use & conservation of farm installations: sanitation, cleaning, disinfecting, repairing, expanding	SPIRITUALITY (6) Rites & rituals	LITERACY (9) Accent marks	ARITHMETIC (13) Subtraction	SOIL CAMPAIGN (9) Plant nutrients: nitrogen, phosphorous, potassium, calcium	HEALTH (5) Wounds
HOME ECONOMICS (9) Using money to improve family nutrition. Improving nutrition improves health	HOUSING CAMPAIGN (11) Floors	CIVICS (9) Rights & duties in relation to the state. Freedom to select one's occupation	ECONOMY & WORK (6) Care of animals during pregnancy cont'd). 4 results of the hygiene of cattle (cont'd)	HISTORY (9) What advancement did the Spanish bring? Elements of advancement brought by other persons (Rockefeller, etc.)	SPIRITUALITY (6) Rites & rituals
NUTRITION CAMPAIGN (9) Milk	CIVICS (7) Rights & duties in family economics	HEALTH (6) Water Conservation	HEALTH (6) Enclosed pastureland	SPIRITUALITY (6) Rites & rituals	ARITHMETIC (13) Subtraction
TIME AND SHORT NEWS ITEMS					
COMMUNITY EDUCATION (9) Human relations	HEALTH (5) Protecting wells	OCCASIONAL CAMPAIGNS (8) Neighborhood educational centers	GEOGRAPHY (9) The river for fish	LITERACY (9) Writing lesson	ECONOMY & WORK (7) Cautions to take during delivery of animals
SPIRITUALITY (6) Rites & rituals	ECONOMY & WORK (6) The bedding of stables, pig sties & chicken coops	HOME ECON (9) More production more money. Using money to improve health conditions on the farm	RECREATION CAMPAIGNS (9) Organizing musical groups	COMMUNITY EDUCATION (8) Conserving natural resources	HUMAN RELATIONS (10) Human relations in the home
LITERACY (9)	ARITHMETIC (13) Multiplication	ECONOMY & WORK (7) Care of animals during pregnancy. 4 results of hygiene of cattle	SPIRITUALITY (6) Rites & rituals	HEALTH (7) Wounds	RECREATION CAMPAIGN (7) Family games

(Numbers in parentheses are minutes)

(Source: Programma -- Curso Progressiva 1970)

Medellin. These are all long wave, and are interconnected by FM repeater stations. Short wave transmissions are sent out from Bogotá on three frequencies.

The regional stations must carry the school courses that originate in Bogotá, but may substitute their own programs for any other network programming. In actuality, the regional stations provide about one-third of their own programs.

What programs are on Radio Sutatenza? About one-third of the long wave broadcast time, one-half of the short wave, is used for the structured study -- the basic, progressive, and complementary courses. This ordinarily consists of 30 minutes a day for the basic course, one hour for the progressive course, one hour for the complementary, with each of these programs repeated once at different times. A little over one-quarter of the broadcast day is used for unstructured education, which has the same objectives as the progressive course but is not in the form of a course. About 30 per cent of the day is given to entertainment, in competition with the commercial radio. About 10 per cent is news.

When the regional stations substitute for network programming from Bogotá it is usually entertainment material, as can be seen from the following table, which compares the programming that originates and is broadcast in Bogotá with that of the regional station in Barranquilla.

The structured programs, of course, present core teaching. They must do so almost necessarily, because the schools do not have

TABLE 34

Daily Air Time in Minutes by Types of Programming: Bogotá (long wave) and Barranquilla, 1971

Bogotá		Barranquilla	
Structured courses	360 (minutes)	Structured courses*	360 (minutes)
Unstructured education	310	Unstructured education*	310
Entertainment	350		
News	120	News*	100
		Local programming	365
Total daily	1,140 (19 hours)		1,140

*Indicates network feed from Bogotá

(Source: Acción Cultural Popular,
quoted by Brumberg)

trained teachers. The radio teacher therefore deals directly with the students, tries to explain things clearly to them, tries to set the stage for their own study and practice.

So much time is devoted to unstructured educational programs because ACPO recognizes that much of its potential audience will not be in the radio schools, and furthermore, that it has an obligation to the alumni of its schools who are expected to become the "new type of Latin American man" Father Salcedo envisaged as "developing from below."

The entertainment and news represent recognition by Radio Sutatenza that it must compete for audience. Many of the educational radio stations in a country like the United States have never recognized this, but successful broadcasters in developing countries invariably have. Thus, for all its spiritual emphasis, Radio Sutatenza lightens its program offerings. The Telescuola programs typically included a comedy scene. A religious radio station in the Philippines (Spain, 1971) competed with a host of commercial stations by putting on its own daily serial, and by carrying a great deal of local news from the villages and barrios.

The printed materials

Acción Cultural Popular publishes about 600,000 textbooks annually for the basic and progressive courses, 70,000 copies each week of a newspaper El Campesino, and about 300,000 copies of books for general reading. These are produced in a large and well-equipped printing shop, Editorial Andes, which is owned by ACPO.

The textbooks are in the same five areas: literacy, arithmetic, health, agriculture, and spirituality. By modern standards of textbooks for broadcast teaching, they are old-fashioned; for example, they include relatively little workbook material to help the student study and practice on his own. They are said not to be up-to-date on all the practices of modern agriculture. This has been explained as a result of the inability of ACPO, which is largely self-financing, to afford the cost of making a fundamental revision of its texts. It is also noted that the textbooks are fragmented, rather than systematic and continuous presentation of a topic. This has an advantage, as well as a disadvantage, in that it permits a school group or a student to start at any point in the course, although he may receive a less well-organized picture of the subject. The straitened finances of ACPO also make it impossible to provide a set of textbooks for every student. The typical pattern is to have one set per school. These are handed around among the six to 10 students.

The newspaper and the books for general reading, like the unstructured educational material on the radio, are an attempt to serve the rural population outside the courses. El Campesino does not depend on current news; that is more likely to be carried by Radio Sutatenza. It is essentially the counterpart of the unstructured educational material on the radio. The copy is carefully rewritten to make it fit the abilities of recent literates and thus to provide another bridge between the courses and real-life use of information. The newspaper publishes monthly supplements of eight pages, which fold into a 32-page booklet, and provides a text for the complementary (third, fourth, fifth grade) classes.

The newspaper sells for approximately two cents, U.S., per copy; the books, for about 10 cents, U.S.,each.

The costs of the program

The finances of Acción Cultural Popular are something of a marvel and much too complicated to be unraveled without a direct on-the-ground study by an economist. The important point, however, is that by making use of every resource possible, this large educational, broadcasting, and publication system has been able in large part to finance its own operations.

The present expenditures in cash are estimated at a little over $4 million per year. About $1 million of this goes for radio, about $35,000 for the newspapers, $1 million for operation of the publishing house, perhaps another million for the teaching and field activities. Of this total, only a little over a million dollars is expected to come from outside sources: about half a million from public funds and a little over that from contributions. The rest of it is self-financed. The radio network, the newspapers, and the book publishing are expected to be completely self-supporting. The publishing house, as a matter of fact, is not only self-supporting, but contributes perhaps a third of its income to other parts of the program.

If one asks how a rural educational system with four long-wave radio stations, three short-wave transmissions, a large weekly newspaper, a book publishing industry at prices that would be less than the cost covers in the United States, with 20,000 schools and somewhere near 200,000 students, can operate for $4 million a year, three-fourths of which is self-generated income, then one can only point to the energy and ingenuity of ACPO's founders and directors. They have been willing to carry advertising on their radio and in their newspaper, to rent out large parts of their headquarters building, to accept a great deal of commercial printing along with their own, and plow the profits back into their educational program. They have been able also to attract the voluntary help of a phenomenal number of persons, most of whom are not paid by ACPO. The auspices of the Roman Catholic church have certainly contributed to this result. Countless parish priests have served as local representatives of the program, and have provided lay representatives from their parishes. Volunteers have been more easily attracted by the private and religious nature of the operation than they would have been by a government operation. The fact that approximately 20,000 unpaid auxiliaries are willing to recruit and supervise local schools is phenomenal. The fact that approximately 600 persons each year are willing to enroll in a four-month program to learn how to conduct literacy classes also testifies to the attractiveness of the program.

Of course, there is another side to this do-it-yourself financing. ACPO apparently cannot afford to revise its textbooks into student workbooks. It makes no attempt to add correspondence assignments to its local schools. It could provide more training for its auxiliaries. But what it has been able to accomplish, without large public funds, is remarkable.

How effective is the program?

The data on effectiveness are not very hard. The most impressive data are the numbers themselves. The schools have increased from 300 in 1950 to 14,000 in 1960 to about 20,000 in 1970. (The high point was about 28,000 in 1965.) The number of students exceeded 100,000 in 1960, reached a peak of about 230,000 in 1965, and was about 167,000 in 1968 when the last summary was compiled by ACPO. The newspaper has a paid circulation of 70,000 per week. One book alone, Mother and Child, sold over 100,000 copies in 1970. The number of non-student listeners to Radio Sutatenza is not known, but is variously estimated in the millions. In a country of perhaps nine million rural people, this represents a potential impact of great size and importance.

Acción Cultural Popular provides figures on enrollments and examination results for both the basic literacy and the progressive courses. From 1960 through 1968, an average of between 80,000 and 90,000 illiterates per year were reported to enroll in the basic course. About half of these took the examination during the year. Of those who took it, somewhere near 70 per cent passed. The figures for 1968 were 75,000 illiterates enrolled (40,000 males, 35,000 females); 27,500 took the exam; 20,180 passed -- over 73 per cent.

During the same 1960-68 period, an average of over 100,000 per year enrolled in the progressive course. Again, about half these took the examination, and about three-fourths of those passed. The figures for 1968 were 92,000 enrolled (49,000 males, 43,000 females); 20,000 took the exam; 15,200 passed, or about 76 per cent. All these figures are rounded.*

A number of figures are cited for community improvement projects accomplished by students in the ACPO courses. Musto (1971), in a study not wholly uncritical of ACPO, found that radio school students scored higher than non-students on attitude scales of modernity, innovativeness, and integration into rural society. He found also that they had higher incomes, which leads a reader to wonder whether the students were not to some extent self-selected from among the more modern, more innovative members of the rural society.

Musto presented this table, which represented his calculation of the relative influence of ACPO and other factors in the adoption of innovations:

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*Enrollments in ACPO have declined considerably since 1965. Musto (1971) attritubed this to the failure of the organization to keep up to date with changing needs of the population and with its materials.

TABLE 35

Reported Importance of ACPO and Other Influences in the Adoption of Innovations

Influencing Factors	Students of ACPO	Non-student Listeners	Others
ACPO	54.0%	25.5%	15.0%
Other development organizations	9.0	13.5	20.0
Imitation (of neighbors, etc.)	33.0	53.5	58.7
Other influences cited	4.0	7.5	6.3

(Musto, 1971, p.175)

It is difficult in this as in all other non-experimentally-controlled field evaluations to separate out effects and causes, and even to evaluate the quality of effects. But it can hardly be doubted that the ACPO program has had an effect. Musto, one of its severest critics, recognizes that "the institution has undeniably achieved improvements at the level of subsistence economy" (Musto, 1971, p. 188). A detailed evaluation, with quantitative field studies, is still worth doing. But even without that, conclusions can be drawn from the experience of ACPO and Radio Sutatenza.

Conclusions from this experience

One can conclude that government financing and government organization is not the only possible way to bring education to rural regions. A dedicated private organization can also accomplish remarkable things, and at some stages in the development process may have advantages over governmental organization in doing so. When one realizes that this program in Colombia is 25 years old and continues at impressive size, one cannot but recall the difficulties of Niger and India and other developing countries with expanding official programs for village people.

In the second place, one can conclude that the study group supported by radio teaching is an effective tool, even with a minimum of trained guidance, without excellent teaching materials, and without the advantage of correspondence study.

However, the experience of Radio Sutatenza serves to underline the conclusions of other experiments: that radio (or television) is insufficient to accomplish a task like this by itself. Rather, it must be built into a teaching system, which in Colombia included the study group, the volunteer organizer and supervisor, textbooks, and printed and broadcast materials to bridge the gap between classes and life problems. The rather remarkable feature of the ACPO classes is how little use was made of trained and expert teachers, either in the classroom (as in the case of the Mexican telesecundaria) or as correspondence tutors (as in the case of the Kenya inservice courses). The effects and circumstances of this reliance upon radio in ACPO are topics that still need to be studied.

The Discussing Group

The purpose of the pattern we have called the "discussing" group is neither primarily to bring about community decision (as with the "deciding" group) nor to teach (as with the "study" group), but rather to bring about awareness of local problems by local people. The assumption is that when a group recognizes a problem it will seek the necessary information and take action toward solving the problem.

This has been the conception behind much of the non-formal group projects in French Africa. Unfortunately, hard data on the effects are very scant. Here we can merely suggest the way the conception has been realized in action, and present such facts as exist to point toward its effectiveness or lack of effectiveness.

The radio clubs of Niger

The Radio Club Association of Niger is now 10 years old. It was observed in 1966 by Lefranc (UNESCO, 1967, vol. 3, pp. 59-78), and again by McAnany (1972). Neither obtained hard data on effects or made detailed economic analyses.

In 1966 there were 42 active clubs; in 1972 there were 28, plus about 50 satellite listening centers without clubs. The 1966 projection of steadily increasing numbers of clubs had not come to pass. Indeed, there were reports that the project had lost some of its original drive and enthusiasm, and that people were thinking of more glamourous and newer devices like television and satellites. The failure of the radio clubs to expand recalls the parallel failure of instructional television to expand in Niger. But the project is still alive after 10 years, and this indicates a certain vitality in the idea.

The bases of the French African discussion group are (a) the "animateur," (b) "feedback" from the community to the broadcasting station and thence to the community again, and (c) discussion.

The animateur is an organizer and group leader, who is trained in a short course, paid an average of about $20 a month (in Niger), and is expected to assemble the group, lead the discussion, and take responsibility for the feedback to the station.

The feedback is a most interesting device. McAnany (1972, pp. 6-7) describes it this way:

> Suggestions for themes of the six months of broadcasts from November to June come from government ministries and from animateurs at their year-end meeting. Themes common to both sources are automatically chosen; otherwise, the suggestions from the villages are given first consideration. Once themes are chosen, the production group works with various experts from the different ministries to create a series of interview questions to be sent the animateur. He then carries out a kind of opinion poll in his area, interviewing a small sample of farmers and the local extension agent if the topic happens to be on cotton production, or parents and the village health worker if it is vaccination. Most animateurs are asked to send by mail about five interviews to the production center. The following week the production team listens to the interviews from the two language groups in order to compile a 30-45 minute program for each group from the material that has arrived from most of the 28 paid animateurs. About two weeks after the original interviews on a Thursday evening, club members can listen to themselves and their neighbors

> talking about some pressing problem. If the program arouses special interest or strong reaction, the recording of the discussion at the meeting is again collected by the production center from the animateurs and forms the basis of a monthly special program called "Carrefour." In addition, the animateur fills out written reports on each meeting and mails them to Niamey at the end of the month. At the year's end there is a meeting of animateurs and a final program summing up the year's work in the radio clubs is made and broadcast. Besides feedback from the animateurs, club members and other home listeners send in letters which are answered. Thus, for the Radio Clubs program content and feedback are one and the same and the audience is both speaker and listener.

The relationship of feedback to discussion is really the essence of this type of group. It requires a timely and faithful reporting by the animateur, and most skillful editing and handling by the radio staff. Lefranc read a number of animateurs' reports in the files and concluded that there was evidence of desirable change of attitudes toward development programs and problems. This is about as far as the available evidence goes on effect.

Lefranc estimated the budget at $77,000 for 1965-66. McAnany estimated it as slightly more in 1972. In 1965-66, as we have said, there were 42 radio clubs and an estimated audience of about 100,000. This latter is, of course, a blue sky estimate, and we do not know how to distribute the cost between clubs and other listeners. At that time there were approximately 700 members in the clubs. If the total cost is distributed over the clubs alone, it cost about $100 per member to keep a club operating for six months, or about $4 per member per meeting. This is rather high for a rural information program and points to the advantage of economies of scale when using a medium like radio. In 1972, the cost would have been even higher. However, it may be unfair to ascribe the whole cost to the clubs. Let us assume, for example, that only one-fourth of it should be charged to the clubs and three-fourths to the listening audience. Then the cost per member per six months would have been $25 per member for six months, or $1 per member per meeting. It would take considerable evidence of effectiveness to justify even this. The radio rural forum in India, which did bring about community change, cost about 20 cents per member per meeting in its pilot stage, and less in its expanded version.

Togo's "rural hour"

A 1966 case study of Radio Togo (Kahnert, et. al., in UNESCO, 1967, vol. 2, pp. 209-226) provides some parallel information on a somewhat similar program.

At that time Radio Togo was broadcasting a program called l'heure rurale (the rural hour) every Thursday night. More precisely, it was filling an hour with three 20-minute programs in two native languages and French. Each program consisted of about five minutes of news specially prepared for a rural audience, plus a 10-minute educational talk. Groups were organized by animateurs, as in Niger, and special efforts were made to get reports from these animateurs on which to base the following programs.

The aims of the program were defined thus:

> The role of the listeners' clubs is to propagate government action throughout the country, to invite the views of listeners on their day-to-day problems in every sphere, such as health, agriculture, education, etc., and for this purpose to organize group listening in rural communities; to give those responsible for broadcast programmes a better knowledge of their audience, and to allow listeners under the direction of qualified leaders to express themselves and make known their ideas and suggestions about the programs.
>
> (Kahnert, 1967, vol. 2, pp. 215-216)

Thus, although there was less emphasis on direct quotation from listeners, the basic idea in Togo as in Niger was to establish a dialogue between club and government, listeners and broadcasters, under the direction of an animateur.

This requires a great deal of the animateur, as well as the station staff. The case study team examined reports in the files in 1966 and concluded that the animateurs were somewhat less than perfectly reliable: only about one-fourth as many reports were filed as would have been expected from the number of clubs. The study team felt, however, that a number of the reports would have been very useful to the broadcasters, in stating grievances and giving constructive information. A small proportion of the reports told of villages making a real effort to establish measures for cleanliness, public health, community improvement, and so forth. This is about the extent of the evidence of effectiveness.

Kahnert estimated the cost per member per meeting of the Togo radio clubs at about 31 cents in 1965. There were more clubs than in Niger, and the meetings went through the year. It was projected that, with expansion of the clubs, the cost would fall to nine cents per meeting per member by the end of 1966. Whether this occurred, we do not know.

The teleclubs of Senegal

In 1965 and 1966 UNESCO sponsored an experiment with television broadcasts to viewing groups of women in the working class districts around Dakar. The purpose of the project was to find out whether television could be used effectively "to impart practical knowledge that is of vital importance for society, and to determine changes in attitude and behaviour as a nation develops and decides for modernity" (Fougeyrollas, 1967, p. 9). In this project feedback was less important than in either Niger or Togo. The emphasis was on discussion. The report of the project said, "The discussions which follow the programmes are of decisive importance. It is during these discussions that the activating and stimulating functions of educational television which takes them beyond the actual subjects taught becomes apparent, and brings underlying social problems to the surface." (Ibid.)

About 500 women were organized, with the help of social service officials, into 10 groups. Over three-quarters of them were illiterate, and half were between 16 and 25, about the same proportion as in the total population. The clubs received two broadcasts a week, one on hygiene and illness, the other on nutrition.

General reports on the clubs were good. Attendance fell off only about 10 per cent after nine months. Discussions were lively; at least 85 per cent of the women were reported to have spoken at least once (speaking takes a certain amount of courage in a group of 50). The women themselves gradually took over much of the managing of discussion and the maintaining of order.

There are no economic figures available on this Dakar project. Considering that television was the medium, and that the total group membership was only 500, unit costs must have been quite high. But we have some information on how much was learned, because the Psycho-Sociological Research Centre of the University of Dakar followed the experiment throughout.

This organization conducted sample surveys among the club members in February, 1965, before the teleclub project, and again in December 1965 and January 1966, at the end of the experiment. A sample of 99 women was drawn, and two interviews were completed with 89 of them. In addition to collecting demographic information and opinions about the programs and the clubs, a number of questions were asked about the substance of the broadcasts and actions taken as a result of the meetings.

At the time of the first survey, only 41 per cent of the women knew malaria was caused by a mosquito bite; 76 per cent knew it at the time of the second survey. In the first survey, no one knew that quinine and its derivatives were a treatment for malaria; 71 per cent had learned it by the time of the second survey. Real causes for dysentery were known by 44 per cent of the sample in the first survey; 78 per cent, in the second survey. Thirty per cent in the first survey knew that tuberculosis was caused by a bacillus; 59 per cent, in the second. In general, the learning about child care, nutrition, and national development was greater than about other topics. The younger women seemed to learn more and to be more willing to change -- particularly in food and child-rearing habits -- than the older women. (We are talking about women under and over 25.) And the great majority of the women reported that they had talked over the subject matter of many of the programs with their husbands, other members of their families, friends, and neighbors. Therefore, there is considerable reason to believe that the club members did learn and passed along some of their new knowledge.

Reflecting on the surveys and their observations of the experiment, the Centre at the University of Dakar came to six conclusions:

> 1. Education through mass media is more effective if it is addressed to a homogeneous audience and meets specific needs.
>
> 2. Educational television...heightens the awareness of the new exigencies in periods of transition. Properly used and planned, it can be a potent factor in national development.
>
> 3. Discussion groups are necessary in conjunction with mass media education in order to render the information imparted socially dynamic.
>
> 4. Adults will learn if the subject really interests or concerns them.
>
> 5. The educational use of the mass media can accelerate, extend and provide a control over the modernization of man.

> 6. Adult education through mass media must always keep the background in mind and adapt its teaching method to the needs of development in any specific socio-psychological situation.
>
> (Fougeyrollas, 1967, pp. 33-34)

Media in Development Campaigns

Campaigns are of course a part of many non-formal programs of education. They were used in the Tanzania program we described, in connection with some of the radio rural forums and the Radio Sutatenza programs, and were related to some of the discussion group meetings. In the following pages we are going to talk about the use of media in continuing development campaigns that typically have their own organization, such as modernizing agriculture, improving health practices, community development, and family planning. Each of these organizes campaigns in a somewhat different way, but they are sufficiently similar that we can let one of them stand for the others.

We are going to use family planning as representative of this group because we have two recent reviews of the media research in that field, by Schramm (1971) and by Ross, et. al. (1972). Certain general findings with reference to instructional media stand out from the approximately 50 relevant studies in the family planning field:

1) All media are campaign media. A well-planned campaign will use whatever media it can command that will reach the audience it wants to reach.

2) Radio, however, because of its wide coverage, its relatively low unit costs, and its ability to reach beyond literates and beyond power mains, is the pre-eminent medium for development campaigns.

3) A combination of media, and, to an even greater degree, a combination of media and related interpersonal communication, is more effective than any medium alone.

4) Information in the media will tend to be passed along in the channels of interpersonal communication.

Let us first cite some of the evidence on radio as a tool of non-formal education in development campaigns:

-- In Sungdong Gu, Korea, a sample of all the women of child-bearing age were asked their chief sources of information on family planning. Forty-seven per cent listed radio, 46 per cent neighbors, 26 per cent home visits by field workers (Park, 1967, p. 75).

-- A radio announcement about family planning was broadcast in Barranquilla, Colombia. Eighty-four per cent of women who heard it were later able to define family planning accurately, but only 54 per cent of those who did not hear it could (Simmons and Stycos, 1970, p. 43).

-- Three radio spots per day were broadcast in Hyderabad District of Pakistan. Seventy per cent of women who had gone to family planning clinics (as opposed to 34 per cent who had not) reported they had heard the broadcasts, and more than half the women in the clinics credited the broadcast for the action they had taken (Karlin and Ali, cited in Schramm, 1971, p. 34).

-- In a survey in Kaohsiung, Taiwan, 35 per cent of all wives said they learned about family planning from the radio. The next most used medium was newspapers (17 per cent) (Cernada and Lu, 1972, p. 201).

But other media also work:

-- A campaign in urban areas of West Bengal used movies, group meetings, newspaper articles, and pamphlets. The percentages of wives in a before-after sample survey who knew about the different methods of contraception almost doubled during the campaign (Balakrishnan and Matthai, 1967, p. 7).

-- In the Meerut District of India, printed materials, cinema slides, and a newsletter were used. Before and after surveys showed that the proportion of urban men and women knowing about the loop increased from 43 to 61, the proportion of rural respondents from 13 to 23 (Raina, Blake, and Weiss, 1967, p. 2).

-- Cross-tabulation of data from about 200 Indian villages showed relationships between acceptance of sterilization or the loop and each of several channels, including group or mass meetings, camps, pamphlets, visits by field staff, and film showings (India Programme Evaluation Organisation, 1970, p. 53).

-- Although response rate was low in a Taiwanese experiment using mailings, acceptors were nevertheless recruited for only $2.66 each (Ross, et. al., 1972, p. 21).

-- A study of new acceptors in Hong Kong showed that half of them had received their information from field workers (Lam, 1967, p. 82).

-- In Taiwan, acceptance rates and decline in fertility are correlated with the number of field workers operating in the district, and to a lesser extent with the number of doctors trained to insert the IUD (Ross, et. al., 1972, p. 23).

Combinations of media, however, are more effective than any one medium or channel:

-- In India a campaign by every possible medium to make known a single slogan and a memorable symbol was found to be, at an early stage of the campaign, the most effective method (Schramm, 1971, p. 20).

-- In Taichung, Taiwan, lins (neighborhoods) informed by all available media had significantly higher acceptance rates than lins using fewer means of communication (Berelson and Freedman, 1964, p. 36; Freedman and Takeshita, 1969, p. 126).

-- In Seoul, Korea, acceptance rates per 100 married women 20-44 years old, during the first year of a study, were 11 per cent in areas receiving mass media treatment only, 12 per cent in areas receiving media plus mailings, 15 per cent in areas with group meetings and media, and 18 per cent in areas using home visits and media (Takeshita, 1966, p. 706).

-- In Jamaica, the rate of acceptance proved to be higher in areas where home visits, group meetings, and pamphlets were used together than in areas where each was used separately (Stycos and Back, 1964, p. 79).

-- A mass media campaign using radio spot announcements only raised the average number of pill acceptors in a province of Iran from 425 per month to 575. A subsequent campaign combining other media with radio raised the average to 650 (Gillespie, 1971, p. 8).

-- (But not everywhere and always) for in Colombia adding pamphlets and home visits to a radio campaign did not significantly increase knowledge or clinic attendance (Simmons and Stycos, 1970, p. 53). But in Seoul, acceptance rates achieved by combining home visits or group meetings with mass media were about double those achieved by mass media alone (Park, 1967, p. 79).

-- (When media and personal channels are combined in an intensive campaign, they are very effective.) For example, an intensive campaign in India using movies, group meetings, posters, newspapers, and pamphlets, increased knowledge of the loop from one per cent to 40 per cent of husbands in the area, from two to 50 per cent of wives (Balakrishnan and Matthai, 1967, p. 7).

-- In Taichung another intensive campaign increased percentage familiar with the IUD from two to 47 per cent. The proportion knowing about the pill, which was not publicized in the campaign, increased only from 19 to 21 per cent (Freedman and Takeshita, 1969, p. 122).

-- A brief intensive campaign in Honduras, using radio, films, sound tracks, and pamphlets tripled the weekly acceptance of contraception (Stycos and Marden, 1970, p. 23-24).

Information transmitted by the media or personal means is passed on through interpersonal channels, so that even a media-only campaign becomes a combined campaign:

-- It was found in Taichung, Taiwan, that visiting only 20 per cent of the homes in an area was more cost-effective than visiting either 30 or 50 per cent of the homes, for the message diffused throughout the neighborhood (Ross, 1966, p. 8).

-- Knowledge of a new IUD clinic in Bangkok appeared all over Thailand before any public education was conducted (Fawcett, Somboonsuk, and Khaisong, 1967, p. 9-10).

-- In Lulliani, Pakistan, 76 per cent of all the acceptors during the first 30 months of a multi-channel campaign came from outside the campaign area. Fifty-three per cent of women from outside Lulliani said they had heard about the clinics from friends, relatives or neighbors. The corresponding figure for Lulliani, where the campaign centered, was only 25 per cent (Cobb and Raulet, 1955, p. 13-14).

> -- Fifty-five per cent of acceptors in a new family planning clinic in Photaram, Thailand, reported that they were motivated to come by friends, neighbors, or other acceptors (Asavasena, Hawley, and Peng, 1966, pp. 97—102).

Combinations vary in effectiveness somewhat with the audience. For one example only:

> -- In Sungdong Gu, women under 30 more often credited mass media with informing them about family planning; women over 30 more often credited neighbors, home visits, group meetings. Dependence on mass media for information increased with education (Park, 1967, pp. 75-76).

Cost figures on the use of media in family planning campaigns are not in a sufficiently systematic form to cite. An economic study along this line would contribute greatly to our ability to compare the efficiency of mass media with personal contacts, individual media with combinations, and simple combinations with complex ones.

Some Conclusions Regarding Media in Non-Formal Education

Incomplete and unsatisfactory as many of these data are, they allow us to state some tentative conclusions.

For one thing, instructional media can be helpful in most types of non-formal education, but they are not always essential. For example, they clearly are not essential in the processing of localizing the school, as we saw it in Tanzania and Chad. On the other hand, it is hard to imagine Acción Cultural Popular accomplishing what it did in Colombia without a base in instructional media. The only alternative would be adding a large core of expert teachers. Nor is it easy to conceive of the rural forum or the rural discussion groups operating as effectively without media except by vastly increasing the size and expertise of field staffs. In these latter cases a medium like radio, if not essential, seems at least to be preferable from the point of view of cost-effectiveness.

In general, the more local the project, the less need of instructional media. The bigger, the more costly and complex the media, the more difficult it is to localize the project. It would make less sense, for example, to operate a highly localized non-formal education program with the support of television than the support of radio. Radio may be the best compromise between a local curriculum and attention to local needs, and the sharing of expert teaching or supporting information over large areas at low cost.

We are tempted to say that radio is the instructional medium of non-formal education. And yet that is not fully accurate. It would be more nearly accurate to say that the Little Media are the media of non-formal education, although television has been used effectively on numerous occasions (for example, the discussion groups in Senegal, the forums around Delhi).

And to come still closer to accuracy we should have to note that no medium alone is really the medium of non-formal education. Even radio is almost never used effectively alone for non-formal education. Always it is combined, in a teaching situation, with some personal contact, some opportunity for interaction (the group in teaching or deciding situations, the field worker in development campaigns). Usually it is combined with other media (the printed text in a teaching situation, posters, filmstrips, and so forth in an informing or deciding situation, the newspaper in many situations).

When one reflects upon this, however, it is seen to be far from unique to non-formal education. Formal education also uses media as part of a teaching-learning system. As we have said, even the most primitive classroom is a multi-media school, though the channels that support the teacher may be only the chalkboard, or writing in the sand, or the surrounding flora and fauna. The media that are used to extend the school are combined with teachers or monitors, texts or workbooks, sometimes correspondence study. When television is used to speed educational reform, all the information channels of the school are kept and television acts to strengthen rather than replace them.

So the instructional media always serve in combination. Within non-formal education the Little rather than the Big Media are likely to appear in that combination, and the combination itself is especially fragile and important because it usually operates without a trained teacher and far from an organized institution.

APPENDIX

[to come]

REFERENCES

Abel, F. P. Use of closed-circuit television in teacher education: Relation to achievement and subject matter understanding. Dissertation Abstracts, 21, 1961, 2999-3000.

Abell, H. C. Radio forum in Ghana -- Assessment of the project. In UNESCO, An African experiment in radio forums for rural development, Reports and Papers on Mass Communication, No. 51. Paris: UNESCO, 1968, 22-71.

Adams, E. Field evaluation of the German CAI Lab. In Atkinson, R.C., and Wilson, H. (eds.) Computer-assisted instruction: A book of readings. New York: Academic Press, 1969.

Allen, D., and Ryan, K. Microteaching. Reading, Mass.: Addison-Wesley, 1969.

Allen, W. H. Media stimulus and types of learning. Audio-Visual Instruction, 12, 1967, 1, 27-31.

Allison, S. G., and Ash, P. Relationship of anxiety to learning from films. (Instructional Film Research Reports.) Port Washington, N.Y.: U.S. Naval Special Devices Center, 1951.

Almstead, F. E., and Graf, R. W. Talkback: The missing ingredient. Audio-Visual Instruction, 5, April 1960, 110-112.

Andersson, G., and Bohlin, E. Sweden -- Adult education by radio and TV (TRU). In Internationales Zentralinstitut, op. cit.

Antioch College. Experiment in French language instruction: Second report, 1959-1960. Yellow Springs, Ohio: Antioch College, 1960.

Ash, P., and Carlson, B. J. The value of note-taking during film learning. (Instructional Film Reports SDC 269-7-21.) Port Washington, N.Y.: U.S. Naval Special Devices Center, 1961.

Atkinson, C. Public school broadcasting to the classroom. Boston: Meador, 1942.

Atkinson, R. C. Computerized instruction and the learning process. American Psychologist, 23, 1968, 225-239.

Attiyeh, R., Bach, G., and Lumsden, K. The efficiency of programmed learning in teaching economics: The results of a nationwide experiment. American Economic Review, 1969, 217-224.

Axeen, M. E. Teaching the use of the library to undergraduates: An experimental comparison of computer-based instruction and the conventional lecture method. Report No. R-361. Urbana: University of Illinois, Coordinated Science Laboratory, 1967.

Balakrishnan, T. R., and Matthai, R. J. India: Evaluation of publicity program on family planning. Studies in Family Planning, I, 1967, 21, 5-8.

Balin, H. B., et al. Cross-media evaluation of color TV, black and white TV, and color photography in the teaching of endoscopy. Philadelphia: Pennsylvania Hospital, September 1968.

Ball, S., and Bogatz, G. A. The first year of Sesame Street: An evaluation. Princeton: Educational Testing Service, 1970.

__________________. The second year of Sesame Street: A continuing evaluation. Princeton: Educational Testing Service, 1971.

Bedall, F. K. Federal Republic of Germany -- The Telekolleg. In Internationales Zentralinstitut, op. cit., 39-58.

Beech, R. P., McClelland, S.D., Horowitz, G.R., and Forlano, G. Final Report: An evaluation of the Dial-a-Drill program. New York: State Education Department, 1970.

Berelson, B., and Freedman, R. A study in fertility control. Scientific American, 210, 1964, 29-37.

Berger, E. J. An investigation of the effectiveness of televised presentations of self-contained television-adapted lessons on enrichment topics in mathematics. Dissertation Abstracts, 23, 1962, 1552.

Berman, A. I. Learning media and selection criteria in science education. Copenhagen: Institute for Studies in Higher Education, University of Copenhagen, 1972.

Bhatia, B., Dubey, D. C., and Devgan, A.K. A study in family planning communication -- direct mailing. Demography, 3, 1966, 343-351.

Bitzer, M., and Boundreaux, M. Using a computer to teach nursing. Nursing Forum, 1969, 8, 291-296.

Bloom, et al. Taxonomy of educational objectives; the classification of educational goals. Handbook I: Cognitive domain (by Bloom, et al.) Handbook II: Affective domain (By Krathwohl, et al.) New York: McKay, 1956.

Bobier, D. T. The effectiveness of the independent use of programmed textbooks in aiding students to overcome skill weaknesses in English, mechanics, and arithmetic. (Doctoral dissertation, University of Michigan.) Dissertation Abstracts, 25, 1965, 3424.

Bretz, R. The selection of appropriate communication media for instruction: A guide for designers of Air Force technical training programs. Santa Monica, Calif.: RAND, 1971.

Briggs, L. J., Campeau, P. L., Gagné, R. M., and May, M. A. Instructional media. Pittsburgh: American Institutes for Research, 1967.

Brumberg, S. Radio Sutatenza. Draft report. New York: International Council for Educational Development, 1972.

Bryan, E. F. A comparative study in the teaching of high school chemistry and physics. Oklahoma City: Oklahoma State Department of Education, 1961.

Callaway, A. Planning out-of-school education for development. Paris: International Institute for Educational Planning, 1971.

Campeau, Peggie L. Level of anxiety and presence or absence of feedback in programmed instruction. San Mateo, Calif.: American Institutes for Research, February, 1965.

Canadian Broadcasting Corporation. Challenge for Change. Toronto: CBC, 1972.

Carpenter, C. R. Television or something else. In Schramm, W. (ed.) Quality in instructional television. Honolulu: University Press of Hawaii, 1972.

Carpenter, H. A. Teaching science by radio. Junior-Senior High School Clearing House, March, 1934.

Carpenter, M. B., Chesler, L. G., Dordick, H. S., and Haggart, S. A. Analyzing the use of technology to upgrade education in a developing country. Santa Monica, Calif.: RAND, March, 1970.

Castle, C. H. Open-circuit television in postgraduate medical education. Journal of Medical Education, 38, 1963, 254-260.

Castleberry, S., and Lagowski, J. J. Individualized instruction using computer techniques. Journal of Chemical Education, 47, 1970, 91-96.

Cernada, G. P., and Lu, L. P. The Kaohsiung study. Studies in Family Planning, 3, 1972, 8, 198-203.

Chance, C. W. Experimentation in the adaptation of the overhead projector utilizing 200 transparencies and 800 overlays in teaching descriptive geometry curricula. Austin: The University of Texas, 1960.

Chu, G., and Schramm, W. Learning from television. Washington: National Association of Educational Broadcasters, 1967.

Constantine, Sister Mary. Radio in the elementary school. Science Education, 48, 1964, 2, 121-132.

Cook, D. C., and Nemzek, C. L. The effectiveness of teaching by radio. Journal of Educational Research, 1939, 33, 105-109.

Corle, C. C. Mathematics teaching behavior changes made by intermediate grade teachers during a 15-week period of instruction by educational television. University Park: Pennsylvania State University, 1967.

Craig, G. Q. A comparison between sound and silent films in teaching. British Journal of Educational Psychology, 26, 1956, 202-206.

Dick, W., and Latta, R. Comparative effects of ability and presentation mode in computer assisted instruction. Audio-Visual Communication Review, 18, Spring 1970, 1, 33.

Dietmeyer, H. J. The effect of the integration of science teaching by television on the development of scientific reasoning in the fifth-grade student. Dissertation Abstracts, 22 1962, 3517-3518.

Dordick, H. S. The Bavarian Telekolleg -- a case study. Report for the Stanford University Institute for Communication Research. Stanford, Calif.,1972.

Doty, B. A., and Doty, L. A. Programmed instructional effectiveness in relation to certain characteristics. Journal of Educational Philosophy, 1964, 55, 334-338.

Dreher, R. E., and Beatty, W. H. Instructional television research project No. One: An experimental study of college instruction using broadcast television. San Francisco: San Francisco State College, April, 1958.

Driscoll, J. P. The effects of mental retardation on film learning. Los Angeles: University of California, n.d.

Dworkin, S., and Holden. A. An experimental evaluation of sound filmstrips vs. classroom lectures. Abstracted in Audio-Visual Communication Review, 8, 1960, 3, 157.

Edling, J. V., et al. The contribution of behavioral science to instructional technology: A resource book for media specialists. Monmouth, Ore.: Teaching Research - A Division of the Oregon State System of Higher Education, 1970.

Elliott, R. W. A study of taped lessons in geography instruction. Westfield, Mass.: The Abner Gibbs Schools.

Erikson, E. H. Childhood and society. New York: Norton, 1963.

Fawcett, J. T., Soomboonsuk, A., and Khaisang, S. Thailand: An analysis of time and distance factors at an IUD clinic in Bangkok. Studies in Family Planning, 1, 1967, 19, 16-19.

Fleishman, E. A. On the relation between abilities, learning, and human performance. American Psychologist, 27, November 1972, 11, 1017-1032.

Forsythe, R. O. Purdue: An open university via radio. In National educational radio: Radio's role in instruction. Washington: National Association of Educational Broadcasters, September, 1972. Supplementary paper, vi-x.

Fougeyrollas, P. Television and the social education of women. Reports and Papers on Mass Communication, No. 50. Paris: UNESCO, 1967.

Freedman, R. and Takeshita, J. Y. Family planning in Taiwan. Princeton: Princeton University Press, 1969.

French Delegation to the Development Assistance Committee. Family homes. Paper for the committee meeting, Paris, October 10-11, 1972.

French Delegation to the Development Assistance Committee. The "Mandoul" Project -- a rural education experiment in Chad. Paper for the committee meeting, Paris, October 10-11, 1972.

Gagné, R. M. The conditions of learning. New York: Holt, Rinehart and Winston, 1965. 2nd edition, 1970.

Gagné, R. M. and Gropper, G. L. Studies in filmed instruction: 1. Individual differences in learning. 2. The use of visual examples in review. Pittsburgh: American Institutes for Research, December, 1965.

Garnier, R. France -- RTS-Promotion. In Internationales Zentralinstitut, op. cit., 105-123.

General Learning Corporation. Cost study of educational media systems and their equipment components. 3 vols. Washington: General Learning Corporation, 1968.

Gilbert, T. F. Mathetics: The technology of education. Journal of Mathetics, 1962, 1, 7-73.

Gillespie, R. Progress report -- Isfahan project. Isfahan, Iran: Population Council, 1971.

Glaser, R. G., et al. Studies of the use of programmed instruction in the classroom. Pittsburgh: Learning Research and Development Center, University of Pittsburgh, and the Baldwin-Whitehall Public Schools, May, 1966.

Glasgow, M. W. A study of the relative effectiveness of selected approaches to the inservice education of teachers in the utilization of in-school radio and television broadcasts. Norman, Okla.: University of Oklahoma, n.d.

Gordon, O. J., Nordquist, E. C. and Engar, K. M. Teaching the use of the slide rule via television. Salt Lake City: KUED, University of Utah, July, 1959.

Gropper, G. L., and Lumsdaine, A. A. An experimental comparison of a conventional TV lesson with a programmed TV lesson requiring active student response. Studies in Televised Instruction, Report No. 2. USOE Project No. 336. Pittsburgh: Metropolitan Pittsburgh Educational Television Stations WQED-WQEX and American Institutes for Research, March, 1961.

Grosslight, J. H., and McIntyre, C. J. Exploratory studies in the use of pictures and sound in teaching foreign language vocabulary. (Technical Report SDC 269-7-53). Instructional Film Research Reports. Port Washington, N.Y.: U. S. Naval Special Devices Center, 1955.

Guilford, J. P. Three faces of intellect. American Psychologist, 14, 1959, 469-479.

Hancock, A. The changing role of educational media. Educational Television International, 3, July 1969, 2.

Hancock, A. Planning for ETV. London: Longman, 1971.

Hansen, D. N., Dick, W., and Lippert, H. T. Research and implementation of collegiate instruction of physics via computer-assisted instruction, vol. 1. Technical Report No. 3. Tallahassee: Florida State University, Computer-Assisted Instruction Center, 1968.

Harry, S. F. Evaluation of a procedure for using daylight projection film loops in teaching skills. (Technical Report SDC 269-7-25). Port Washington, N.Y.: U. S. Naval Special Devices Center, 1952.

Hartman, F. R. Investigation of recognition learning under multiple channel presentation and testing conditions. In Research on the Communication Process: A Report Covering the Period September 1958-September 1960. University Park: The Pennsylvania State University, 1960, 5/1-5/26.

Heidgerken, L. An experimental study to measure the contribution of motion pictures and slide films to learning certain units in the course introduction to nursing arts. Journal of Experimental Education, 17, 1948, 2, 261-293.

Herminghaus, E. G. Large group instruction by television: An experiment. School Review, 65, 1957, 119-133.

Heron, W. T., and Ziebarth, E. W. A preliminary experimental comparison of radio and classroom lectures. Speech Monographs, 13, 1946, 54-57.

Hilgard, E. R. Evolution stages in the evolution of learning. Contemporary Psychology, 17, October 1972, 10, 513-515.

Hill, S. A. A comparative study: Two methods of teaching reading -- conventional and programmed. Unpublished doctoral (Ed.D.) dissertation, Mississippi State University, 1968.

Hirschman, A. O. Development projects observed. Washington: The Brookings Institution, 1967.

Hoffbauer, H. Federal Republic of Germany -- the Quadriga-Funkkolleg in Pedagogy. In Internationales Zentralinstitut, op. cit., 82-104.

Hollister, W. G., and Bower, E. M. Behavioral science frontiers in education. New York: Wiley, 1966.

Homeyer, F. C. Development and evaluation of an automated assembly language teacher. Technical Report No. 3. Austin: University of Texas, Computer-Assisted Instruction Laboratory, 1970.

Hovland, C. I., Lumsdaine, A. A., and Sheffield, F. D. Experiments on mass communication. Princeton; Princeton University Press, 1949.

Hull, C. L. Principles of behavior. New York: Appleton-Century-Crofts, 1943.

Instructional Film Research Program. *Evaluation of the film: Military police support in emergencies. (Technical Report SDC 269-7-52.) Instructional Film Research* Reports. Port Washington, N.Y.: U. S. Naval Special Devices Center, 1954.

Internationales Zentralinstitut. Multi-media systems in adult education: Twelve project descriptions in nine countries. Munich: Internationales Zentralinstitut für das Jugend-und Bildungfernsehen, 1971. (Also German edition, 1971: Mediensysteme in der Erwachsenenbildung: Zwölf projektanalysen aus neun Landern).

Jacobs, J. N., and Bollenbacher, J. K. Teaching ninth grade biology by television. *Audio-Visual Communication Review,* 8, 1960, 176-191.

Jain, N. C. The influence of group radio listening, discussion, decision, and commitment on attitude change in radio forums. Paper (summarizing a doctoral dissertation) for International Communication Division, Association for Education in Journalism, Berkeley, Calif., August 22-25, 1969.

Kahnert, F., et al. Radio Togo's educational programme. In UNESCO, *New educational media in action - Case studies,* 2, 209-226. Paris: UNESCO, 1967.

Kale, S. V. Learning and retention of English-Russian vocabulary under different conditions of motion picture presentation. State College: Pennsylvania State College, 1953.

Karlin, B., and Ali, J. M. The use of the radio in support of family planning program in the Hyderabad District of West Pakistan. In Schramm, W. Communication in family planning, op. cit., 1971, 34.

Keislar, E. R. Abilities of first grade pupils to learn mathematics in terms of algebraic structures by means of teaching machines. Los Angeles: University of California at Los Angeles, 1961.

Kelley, E. C. The fully functioning self. In Combs, A. W. (ed.) *Perceiving, behaving, becoming*. Washington, D. C.: Association for Supervision and Curriculum Development, 1962.

Kendler, H. H. The concept of the concept. In Melton, A.W. (ed.) *Categories of human learning*. New York: Academic Press, 1964.

Kimble, G. A. *Hilgard and Marquis' "Conditioning and Learning."* New York: Appleton-Century-Crofts, 1961.

Kimmel, P. Educational radio and television in Australia. In Kimmel, P., Kies, N., and Lyle, J. ITV and education of children: Cross-cultural comparisons of international uses of media, vol. II -- case studies, 7-44. Washington: The American University, January, 1971.

Kinane, K. Australia's correspondence schools, with supporting broadcast programmes, and Radio University. In UNESCO, New educational media in action -- Case studies, 1, 169-203. Paris: UNESCO, 1967.

Krathwohl, D. R., et al. Taxonomy of educational objectives, Handbook II: Affective domain. New York: McKay, 1964.

Krival, A. S., et al. Project report: Radio/correspondence education project No. 615-11-650-129. USAID/UWEX (Kenya). Part I: Administration (Krival); Part II: Evaluation (Thiede). Madison: University of Wisconsin, Extension Division , 1970-71.

Lefranc, R. Educational television in Niger. In UNESCO, New educational media in action -- Case studies, 2, 11-48. Paris: UNESCO, 1967.

Lefranc, R. Radio clubs in Niger. In UNESCO, New educational media in action -- Case studies, 3, 59-78. Paris: UNESCO, 1967.

Lefranc. R. Radiovision as an aid to literacy in Niger. In UNESCO, New educational media in action -- Case studies, 3, 41-58. Paris: UNESCO, 1967.

Lumley, F. H. Rates of speech in radio speaking. Quarterly Journal of Speech, June, 1933.

Lyle, J. The NHK Gakuen of Japan. In Kimmel, P., Kies, N.E., and Lyle, J. ITV and education of children: Cross-cultural comparisons of international uses of media, vol. II - case studies, 127-160. Washington: The American University, January, 1971.

Lyle, J., et al. Colombia's national programme for primary-level instruction. In UNESCO, New educational media in action -- Case studies, 1, 49-76. Paris: UNESCO, 1967.

Lyle, J., et al. The Centro di Telescuola of Italy. In UNESCO, New educational media in action -- case studies, 3, 11-40. Paris: UNESCO, 1967.

Mager, R. Preparing objectives for programmed instruction. Palo Alto, Calif.: Fearon, 1962.

Markle, D. G. The development of the Bell System first aid and personal safety course: An exercise in the application of empirical methods to instructional system design. Palo Alto, Calif.: American Institutes for Research, April, 1967.

Martini, H. R. Development of filmstrip sequence photographs and sound reproduction of educational television presentations. Coatesville, Pa.: North Brandywine Junior High Schools, February, 1967.

Maslow, A. H. Some basic propositions of the growth self-actualizing psychology. In Combs, A.W. (ed.) Perceiving, behaving, becoming. Washington, D. C.: Association for Supervision and Curriculum Development, 1962.

Mathur, J. C., and Neurath, P. An Indian experiment in farm radio forums. Paris: UNESCO, 1959.

McAnany, E. Radio clubs of Niger: September, 1972. Stanford: Institute for Communication Research, 1972 (mimeo).

McCombs, M. Chicago's Television College. In UNESCO, New educational media in action -- Case studies, 2, 99-128. Paris: UNESCO, 1967.

McIntyre, C. J. An application of the principles of programmed instruction to a televised course in college economics. Urbana, Ill.: University of Illinois, 1966.

McNeil, J. D. Programmed instruction as a research tool in reading: An annotated case. Journal of Programmed Instruction, 1, 1962, 1, 37-42.

Menee, J. W., Klingenschmidt, J. E., and Nord, D. L. The feasibility of using taped lectures to replace class attendance. Paper for the American Educational Research Association, Los Angeles meeting, 1969.

Miller, J. G. Deciding whether and how to use educational technology in the light of cost-effectiveness evaluation. Cleveland, Ohio: Cleveland State University, n. d.

Miller, R. M. The meaning of development and its educational implications. In Agricultural Development Council reprint, October, 1972, 5-10. New York: Agricultural Development Council, Inc.

Monahan, P. E., et al. Multimedia instruction programs in mathematics -- demonstration and experimentation. Whitewater, Wis.: Wisconsin Heights Schools System and University of Wisconsin, 1966.

Mowrer, O. H. Learning theory and behavior. New York: Wiley, 1960.

Murphy, F. E. The relative effectiveness of filmed introductions to a general science motion picture. Dissertation Abstracts, 22, 1962, 3121.

Musto, S. A. Massenmedien als Instrumente der landlichen Entwicklungsförderung: Wirkingsanalyse von "Acción Cultural Popular - Radio Sutatenza" (Kolumbien). Berlin: Verlag Bruno Hessling, 1969. (Republished in Spanish with ACPO comments, 1971).

Nelson, H. E. The relative contribution to learning of video and audio elements in film. State College: Pennsylvania State College, 1951.

Neu, D. M. The effects of attention-gaining devices on film-mediated learning. Abstracts of Doctoral Dissertations, Pennsylvania State College, vol. 13. State College: Pennsylvania State College, 1951, 414-417. And Journal of Educational Psychology, 42, 1951, 479-490.

Neurath, P. School television in Delhi. New Delhi, India: All-India Radio, 1968.

NHK Radio-Television Cultural Research Institute. The effects of educational radio music classroom, April-December 1956. Tokyo.

NHK Radio-Television Cultural Research Institute. The listening effect of radio English classroom. April 1954-March 1955. Tokyo: NHK, 1956.

Pant, N. K. Correspondence education in India. Bulletin of the UNESCO Regional Office for Education in Asia, VI, September 1971, 1, 19-24.

Park, H. J. Use and relative effectiveness of various channels of communication in the development of the Korean family planning programme. In Communication in family planning, Bangkok: United Nations, 1967, 69-81.

Patrick, R. B. The measurement of the effectiveness of the documentary sound-film as a supplement in the teaching of methods to college students being prepared to teach in the secondary schools. University Park: Pennsylvania State University, 1958.

Paulu, B. Europe's second chance universities. Educational Broadcasting Review, 3, June 1969, 3, 60-82.

Pavlov, I. P. Conditioned reflexes. London: Oxford, 1927.

Peerson, N. An experiment, with evaluation, in the eradication of adult literacy by use of television instruction over a state educational television network supplemented by supervised group viewing and by the related use of project-supplied materials of instruction. Florence, Ala.: Florence State College, August, 1961.

Piaget, J. Six psychological studies. New York: Random House, 1967.

Pickrel, G., Neidt, C., and Gibson, R. Tape recordings are used to teach seventh grade students in Westside Junior-Senior High School. Omaha: National Association of Secondary School Principals Bulletin, 42, 1958, 234, 81-93.

Plowright, P. Towards a school TV service in the Sudan. Education Television International, 2, 1968, 1, 17-23.

Popham, W. J. Tape recorded lectures in the college classroom - II. Audio-Visual Communication Review, 10, 1962, 94-101.

Porter, D. A. An application of reinforcement principles to classroom teaching. Cambridge: Laboratory for Research in Instruction, Graduate School of Education, Harvard University, 1961.

Postman, L. The present status of interference theory. In Cofer, C.N. (ed.) Verbal learning and verbal behavior. New York: McGraw-Hill, 1961.

Programmed learning in Central African contexts. Salisbury, Rhodesia: University College of Rhodesia, Faculty of Education, Occasional Papers No. 7, n.d.

Raina, B. L., Blake, R. R., and Weiss, E. M. India: A study in family planning communication, Meerut District. Studies in Family Planning, 1, 1967, 21, 1-5.

Ratanamungala, B. Instructional radio: A decade of Thai experience. Bangkok: Ministry of Education, 1972.

Razran, G. Mind in evolution: An East-West synthesis of learned behavior and cognition. Boston: Houghton-Mifflin, 1971.

Reid, J. S., and MacLennan, D. W. Research in instructional television and film. Washington: U.S. Department of Health, Education, and Welfare, Office of Education, 1967.

Roid, G. H. Covariates of learning in computer-assisted instruction. Montreal: McGill University, n.d.

Ross, J. A. Cost analysis of the Taichung experiment. Studies in Family Planning, 1, 1966, 10, 6-15.

Ross, J. A., Germain, A., Forrest, J. E., and van Ginneken, J. Findings from family planning research. Reports on Population/ Family Planning, 12, October 1972, 1-47.

Rosselot, L. Evaluation of the Otterbein College film-text method of teaching French, at five Ohio institutions. Westerville, Ohio: Otterbein College, Sept. 30, 1961.

Roy, F. B., Waisanen, E., Rogers, E. The impact of communication on rural development: An investigation in Costa Rica and India. Paris: UNESCO, 1969.

Rulon, P. J. The sound motion picture in science teaching. Cambridge: Harvard University Press, 1933.

Rural Development Division. Establishing district training centres. Dar es Salaam: Ministry of Local Government and Rural Development, 1968.

Scanland, F. W. An investigation of the relative effectiveness of two methods of instruction, including computer-assisted instruction, as techniques for changing the parental attitudes of Negro adults. Tallahassee: Florida State University, July 15, 1970.

Schalock, H. D. Learner outcomes, learner processes, and the conditions of learning. In Edling, et al. The contributions of behavioral science to instructional technology. Monmouth, Ore.: Teaching Research - A Division of the Oregon State System of Higher Education, 1970.

Schiefele, H., and Schardt, A. Telekolleg im Studienprogram des Bayerischen Rundfunks. Wissenschaftliche Begleit-untersuchung. Heft 1. Munich: Telekolleg, 1971.

Schramm, W. Communication in family planning. Reports on Population/ Family Planning, 7, 1971, 1-43.

Schramm, W. Instructional television in the educational reform of El Salvador. Washington, D. C.: Academy for Educational Development, 1972.

Schramm, W., et al. Educational radio in Thailand. In UNESCO, New educational media in action --case studies, 1, 83-104. Paris: UNESCO, 1967.

Schramm, W., et al. Educational television in American Samoa. In UNESCO, New educational media in action -- case studies, 1 11-58. Paris: UNESCO, 1967.

Schramm, W., et al. Ten years of the radio rural forum in India. In UNESCO, *New educational media in action -- case studies*, 1 105-134. Paris: UNESCO, 1967.

Schramm, W., Coombs, O. H., Kahnert, F., and Lyle, J. *The new media: Memo to educational planners*. Paris: UNESCO, 1967.

Simmons, A. B., and Stycos, J. M. Information campaigns and the growth of family planning in Colombia. Ithaca: International Population Program, Cornell University, 1970.

Sjogren, D. D. Programmed materials in high school correspondence courses. Lincoln: University of Nebraska, n.d.

Skinner, B. F. *The behavior of organisms; an experimental analysis.* New York: Appleton-Century-Crofts, 1938.

Slattery, Sister M. J. *An appraisal of the effectiveness of selected instructional sound motion pictures and silent filmstrips in elementary school instruction.* Catholic University, 1953.

Smith, K. U., and Smith, M.F. *Cybernetic principles of learning and educational design.* New York: Holt, Rinehart and Winston, 1966.

Speagle, R. E. Educational reform and instructional television in El Salvador: Costs, benefits, and payoffs. Washington, D. C.: Academy for Educational Development, 1972.

Spencer, R. E. Comparisons of televised with teaching machine and televised with instructor presentations of English grammar. In Carpenter, C. R., and Greenhill, L.P. (eds.) *Comparative research on methods and media for presenting programmed courses in mathematics and English.* University Park: Pennsylvania State University, March, 1963.

Stanford University, Institute for Communication Research. Learning in American Samoa. Reports to the Government of American Samoa by W. Schramm: Quick reference tables of scores, 1972. Some key questions concerning standardized testing and improvement in the schools of American Samoa, 1972. The locally-made tests, 1972. Attitudes toward instructional television, 1973. Effect of the new program on oral English, 1973.

Stanford University, Institute for Communication Research. Reports on instructional media projects in Mexico: A cost-effectiveness analysis of the Mexican Telesecundaria, 1973 (Mayo, J., McAnany, E., and Klees, S.). A cost-effectiveness analysis of the Mexican Radioprimaria, 1973 (Spain, P., Klees, S.).

Stanford University, Institute for Communication Research. Television and educational reform in El Salvador. Complete report of the first year of research (McAnany, E., et al.), 1970. Complete report of the second year of research (Mayo, J., et al.), 1971. Complete report of the third year of research (Hornik, R., et al.), 1972. An administrative history of El Salvador's educational reform (Mayo, J. and Mayo, J.) 1971.

Stein, S. C. An experimental study of the use of motion picture film loops in the instruction of beginning typewriting. *Dissertation Abstracts*, 19, 1959, 3253.

Stickell, D. W. A critical review of the methodology and results of research comparing televised and face-to-face instruction. Unpublished Ed.D. dissertation, The Pennyslvania State University, 1963.

Stolurow, L. M., and Beberman, M. Comparative studies of principles for programming mathematics in automated instruction. Urbana, Ill.: Training Research Laboratory, University of Illinois, July, 1964.

Stycos, J. M., and Back, K. W. *The control of human fertility in Jamaica*. Ithaca: Cornell University Press, 1964.

Suppes, P. Computer-assisted instruction at Stanford. Stanford: Institute for Mathematical Studies in the Social Sciences, May 19, 1971.

Suppes, P., and Morningstar, M. Computer-assisted instruction at Stanford, 1966-69: Data, models, and evaluation of the arithmetic program. New York: Academic Press, 1972.

Taba, H., Levine, S., and Elzey, F. F. *Thinking in elementary school children*. San Francisco: San Francisco State College, 1964.

Takeshita, J. Lessons learned from family planning studies in Taiwan and Korea. In Berelson, B., et al. (eds.) *Family Planning and Population Programs*. Chicago: University of Chicago Press, 1966.

Tannenbaum, P. H. Instruction through television: A comparative study. Urbana: Institute of Communication Research, University of Illinois, June,1956.

Tendam, D. J., et al. Preparation and evaluation in use of selected demonstrations from the introductory college physics course. West Lafayette, Ind.: Purdue Research Foundation, August 31, 1961.

Theroux, P. Education by radio: An experiment in rural group listening for adults in Uganda. Kampapa, Uganda: Makerere College. Makerere Adult Studies Centre, Occasional Paper No. 6, n.d.

Thorndike, E. L. Animal intelligence: An experimental study of the associative processes in animals. Psychological Review Monograph Supplement, 2, 1898, No. 8.

Toffel, G. M. Effectiveness of instruction by television in teaching high school chemistry in Alabama schools. University, Ala.: University of Alabama, August, 1961.

Tolman, E. C. There is more than one kind of learning. Psychological Review, 56, 1949, 144-155.

Tsuji, I. The effect of TV school broadcasts on children in isolated villages. Tokyo: NHK Radio and TV Culture Research Institute, 1964.

Tymowsky, J. Poland - Politechnika Telewizjna. In Internationales Zentralinstitut, op. cit., 152-166.

Tymowsky, J., et al. Television for higher technical education of the unemployed: A first report on a pilot project in Poland. Reports and Papers on Mass Communication, No. 55. Paris: UNESCO, 1969.

Uganda Department of Agriculture. A guide for extension workers. Entebbe, Uganda: Ministry of Agriculture, Forestry and Cooperatives, 1968.

Underwood, B. J. The representativeness of rote verbal learning. In Melton, A. W. (ed.) Categories of human learning. New York: Academic Press, 1960.

VanderMeer, A. W. Relative effectiveness of instruction by: films exclusively, films plus study guides, and standard lecture methods. Port Washington, N.Y.: U. S. Naval Special Devices Center, 1950.

VanderMeer, A. W. The economy of time in industrial training: An experimental study of the use of sound films in the training of engine lathe operators. Journal of Educational Psychology, 36, 1945, 65-90.

Vernon, P. E. An experiment on the value of the film and filmstrip in the instruction of adults. British Journal of Educational Psychology, 16, 1946, 3, 149-162.

Von Mondfrans, A. P., and Houser, R. L. Toward a paradigm for selecting media to present basic concepts. Paper presented to annual meeting of the American Educational Research Association, March, 1970. West Lafayette, Ind.: Purdue University, 1970.

Wagner, G. Austria - The radio course "Lebendige Wirtschaft." In Internationales Zentralinstitut, op. cit., 26-38.

Wermer, F. E. Netherlands - TELEAC (Stichting Televisie Academie). In Internationales Zentralinstitut, op. cit., 138-151.

Westley, B. H., and Barrow, L. C., Jr. Intelligence and the effectiveness of radio and television. Audio-Visual Communication Review, 7, 1959, 193-208.

Whitted, J. H., Jr., et al. Development and experimental evaluation of an automated multi-media course on transistors. Camden, N.J.: RCA Service Company, September, 1966.

Williams, D. C., Paul, J., and Ogilvie, J. C. Mass media, learning, and retention. Canadian Journal of Psychology, 11, 1957, 157-163.

Wise, H. A. Motion pictures as an aid in American history. New Haven: Yale University Press, 1939.

Wittich, W. A., et al. The Wisconsin physics film evaluation project. Madison: University of Wisconsin, 1959.

Wood, A. W. The community school in Tanzania - The experience at Litowa. Teacher Education in New Countries, 14, 1969, 4-12.

Woodworth, R. S. Dynamics of behavior. New York: Holt, Rinehart and Winston, 1958.

Xoomsai, T., and Ratanamangala, B. School broadcast: Its evaluation. Bangkok: Ministry of Education, 1962.

Young, J. P., and Stolurow, L. M. A CAI study of learning geologic time and evolution. Cambridge: Harvard University, Computer-Aided Instruction Library, September, 1969.